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USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

No. 10

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INDUSTRY PLANNING AND ECONOMICS

USSR MACHINE TOOL TRADE WITH FRG REVIEWED

Moscow IZVESTIYA in Russian 4 Jul 83 p 5

[Article by A. Grigor'yants, IZVESTIYA correspondent: "Machine Tools from Babenhauzen"]

[Text] Babenhauzen is a small town located among green pastures and yellow wheat fields. Somewhere cow barns reek. The small town has still not cut the umbilical cord connecting it to agriculture, but it has already lived for a long time by industry. On its outskirts, immediately beyond the frame buildings, rise the orange buildings of the plant. Everything in it is modest in size. It is a typical medium size enterprise with slightly over 600 employees. I got a room at the local hotel with difficulty. People come to Babenhauzen from everywhere. They come for the products of the "El'b-Shlif" Firm -- for special design precision machine tools.

Lothar Schussler, one of the managers, spread out a pile of colorful pamphlets for me. The firm is small, but in the polishing business in the FRG [Federal Republic of Germany], it has perhaps no equal. It produces sets of special machine tools for the medical, power and motor vehicle industries that make it possible to manufacture the most varied products -- from knives and electric razors to turbine vanes. The novelty of the technical solutions and high quality insure a continuous sale of its output. It is exported to over forty countries. The Soviet Union is among the largest partners of the "El'b-Shlif."

I came to the firm at a time when great preparations were being made at the plant to fulfill a large Soviet order. We are speaking about machine tools for polishing turbine vanes.

"This is not the first Soviet order," said L. Schussler. "We have been cooperating with Soviet organizations since 1958. As you may note, from the time when political relations between our countries were not entirely harmonious. Things went well and from pure commerce we changed over to cooperation. The cooperation agreement was signed in 1980. How is it expressed? We supply our products to the USSR and, in exchange, we acquire Soviet products."

"I will say with a clear conscience," continued L. Schussler, "that customers are pleased with Soviet products. As a whole, we have already purchased more than 150

machine tools. Part of them we use at our own enterprise. They operate faultlessly. Briefly, we are pleased to cooperate with the USSR. Things are proceeding excellently. Our mutual contacts multiply. We meet each other constantly halfway, we understand each other and wish to proceed further -- develop designs jointly, sell common products jointly in markets of the third world countries and cooperate more closely in the scientific technical area. All of this is mutually beneficial. I think that in building relationships with other countries, politicians must take economic interests into account."

This thought is more and more frequently expressed in business circles in the FRG that are interested in free commerce with the USSR, and it has reached an impressive volume. Last year, the goods turnover increased to 6.6 billion rubles, i.e., it increased eight-fold in ten years. The FRG occupies first place in commerce between the Soviet Union and capitalist countries, while the USSR is among the ten largest commercial partners of the FRG.

The quantitative increase is accompanied by qualitative changes. A considerable part of the commercial-economic ties between the USSR and the FRG involves large scale and long term cooperative projects, including those on a compensation basis. Today, the following transactions occupy an important place in our trade with the FRG: they involve over 20 percent of the total trade turnover in cost. Such transactions are contracts to deliver Soviet natural gas to the FRG, tied in some respects to the purchase of pipe, machines and equipment in the FRG to build the gas pipeline mains in the Soviet Union. Over 60 billion cubic meters of the "blue fuel" has already been supplied to the FRG. When the Urengoy-Uzhgorod gas pipeline is completed the annual delivery volume will reach 10.5 billion cubic meters. An agreement is being successfully implemented to create the Oskol'sk Electrometallurgical Combine, a combine to produce polyester fibers and, as compensation, on deliveries of chemical products and cotton. The agreement also includes the construction of the Sayan Aluminum Plant and others.

Due to these large scale projects in the present complicated situation, the economic-trade ties between our countries have withstood the tests for strength. The attempts of Reagan's administration to urge Bonn to wage a trade war against the USSR failed. Washington was also unsuccessful in disrupting FRG participation in the Urengoy-Uzhgorod gas pipeline project.

At the same time, it cannot be said that the pressure from beyond the ocean remains without consequences. Even Bonn itself is guilty of measures of a discriminating nature. There are still quantitative limitations on importing a considerable number of goods to the USSR. The export condition of West German goods into the USSR deteriorated because, frequently, the West German firms could not supply complete equipment containing, even in small volume, parts and units on NATO's prohibited lists.

Yet, business is going on. Economic cooperation between the USSR and the FRG is developing and becoming richer with new forms. Among them -- production cooperation. Already 19 corresponding agreements are in operation. Several more are being prepared. On the basis of such cooperation, automatic cement mixers, presses, sport shoes and machine tools are manufactured in the Soviet Union.

Yes, machine tools, including those with the participation of Babenhauzen's "El'b-Shlif"... The plant shops are clean, everything is in order. You can see at once that no ordinary products are manufactured here. The machine tool park is modern. It was pleasant to see Soviet machine tools from Khar'kov, Orsha and Moscow alongside international brand systems. Engineer Gunther Wilsch, young and energetic, observes that Soviet machine tools meet all requirements.

"In several days I am going to the plant in Orsha for two weeks," he informs us. "Our contacts with Soviet colleagues are becoming stronger. We exchange experience and technical ideas. I can say frankly: we can learn something from the USSR machine tool builders."

Contacts, as they say, are being made at all levels. Director of the plant, Adam Klotz, named me ten names of Soviet managers whom he has many occasions to contact and do business with.

"We are very pleased with the cooperation. It is mutually beneficial. The agreement on cooperation is being implemented well. But there are conditions for closer technical collaboration. We would like to develop automatic control systems jointly. At present we are preparing a symposium to exchange experience with our colleagues in the USSR. Of course, there are problems, but they are being solved in constant and friendly contacts to our mutual satisfaction.

...It is the evening. Babenhauzen's streets empty rapidly; they go to bed early here. This is understandable; this is a small town where workers with modest desires and simple requirements live. And the main ones of them -- to be in agreement with their neighbors and live in peace.

2291
CSO: 1823/93

INDUSTRY PLANNING AND ECONOMICS

MODERN MANAGEMENT, MACHINE TOOLS RAISE EFFICIENCY AT SVERDLOV PLANT

Moscow EKONOMICHESKAYA GAZETA in Russian No 27, Jul 83 p 8

[Article by Gennadiy Andreyevich Studenok, director of the Sverdlov Transport Machinebuilding Plant imeni Sverdlov, candidate of economic sciences: "Equipment and Economics"]

[Text] The Sverdlov Transport Machinebuilding Plant imeni Sverdlov is an enterprise well known in the Urals for its revolutionary and labor traditions. It produces devices for general machinebuilding use, consumer goods and spare parts. The output is fairly complicated. The plant collective not only provides a high standard of production of equipment but is also economical. Director Gennadiy Andreyevich Studenok, graduate of the Polytechnical Institute, is a candidate of economic sciences and, for a number of years, has occupied the post of chief engineer of the Sverdlov Coal Machinebuilding Plant. He reflects, in this published article on how urgent problems on raising the efficiency of production on the basis of technical progress are solved and on the problems that originate in so doing.

My interest and surely that of other directors, was aroused by the article of R. Mangutov, general director of the "Tashtekstil'mash" Association published in No 21 of the EKONOMICHESKAYA GAZETA. He considers questions of assimilating new machines and planning technical progress in series production. I would also like to speak on this subject.

To be an innovator or a conservative? At present, this question is hardly worthwhile asking anyone because it is illegal. Innovators are fighters for progress -- this always sounds honorable, being reputed to be a conservative is very bad. But backwardness has many faces and in everyday life there sometimes arise contradictory situations when to make a single-valued conclusion is difficult.

From Positions of Efficiency

Here is an example in plant practice. We equipped a comprehensively mechanized line for gas-cutting parts of sheet steel. Working conditions were improved considerably, operation man-hours were reduced by 2500 norm-hours per year and the labor of one out of five was saved. Good? Unquestionably, yes. I want to note, however, that the line was five times more expensive than the previous equipment and will pay for itself in five years which would be wrong not to consider economically.

At present, the economic aspect of improving the technological process is becoming preeminent. The importance of this is confirmed by another example. A modern comprehensively mechanized line for manufacturing a number of complicated parts was introduced. It consists of four machining centers. This is a regular section that produces first-class products in considerable amounts. The relative efficiency of the capital investments is higher. Labor expenditures are reduced due to the newest equipment and three workers were freed conditionally (there are 15 people in the collective). True, several hundred thousand rubles were invested in the section in three years. The expenditures will be repaid in nine years according to calculations.

As we can see, the time for repayment for capital investments is too long. The circumstances must also be taken into account that during the indicated period, demands of the technical standard of the products and of labor-intensiveness of their production will increase (in about five years it will be considered excessive). This means that it will again be necessary to think about improving the equipment.

There is no doubt that the economic expediency of technical solutions should be weighed thoroughly in each case no matter how attractive it appears at first glance.

With this viewpoint the possibilities of machine tools with numerical programed control appear different for various cases. It is well known that such machine tools are very productive, precise and, at the same time, expensive. The costs of preparing the programs and for setting-up are high. When introduced one by one, without the associated devices, machine tools with ChPU [Numerical Programed Control] do not provide the necessary profitability.

How cautious it is necessary to be was indicated to us once more by the creation of two mechanized sections, similar in specialization. In one of them flywheels, drums, flanges and similar large size parts were turned, while in the other one -- the same parts but of small size. A number of machine tools was installed, but alternately with the old equipment.

I will mention: the newest equipment may be combined with the old; however, in such a case, technologists must proceed on an economically substantiated basis. Otherwise, an overlapping occurs with consequent complications. Eight people were freed. Production costs dropped as did periods of paying for the equipment, but the section was not an integrated unit.

Something different was done in the second section. It was designed so that it represented a full-fledged system of automated subsystems such as machine tools with ChPU and technological equipment; transport-warehousing equipment; tool organizations of works; means for recording production progress; dispatcher communications and a computer control center. A sufficient list of parts was provided to load the section. The effectiveness with respect to the number of freed workers and of the capital investment repayment time was 1.5 times as great as in the first section.

From what has been stated above, a conclusion suggests itself which, in my opinion, is important for many production and design collectives. It is important to evaluate the effectiveness of the machine tool, the automatic line and other equipment not individually, but in a technological system.

In our plant there is an original section where the "Tsiklon-3B" robots operate. Three robots stamp up to 3000 bolts per shift of practically all type-sizes needed by the plant with a diameter of from five to fifty millimeters. The high stamping speed is provided by complicated devices called auxiliary devices for heating the intermediate products with high frequency current etc.

Taking into account the accumulated experience, two more sections with thirteen robots were reequipped and placed in operation recently. By the end of the five-year plan period there will be about fifty of them. In connection with the "robotization" the problem of technical-economic unity in the development of production is becoming more acute. In fact, frequently the effectiveness of the innovation depends on the special features of the design or the manufacturing quality at the supplier enterprises. It is difficult to influence an increase in the efficiency of a finsihed machine tool or of a machine after it has been set in place.

Thus, on our order, the Izhevsk Machinebuilding Plant manufactured a standard unit machine tool for turning footings. We paid 33,000 rubles for it.

Its assimilation was delayed. Undoubtedly, such a thing would not happen if there were closer ties between the two enterprises.

Here is still another problem. In the initial period of equipment assimilation, the output-capital ratio usually drops. As the loading and utilization of the equipment rise, the output-capital ratio indicator whould improve as soon as possible.

Sometimes this does not happen. We do not agree with references to various objective causes which, at times, are given by managers -- they say the plan calls for too rigid labor productivity indicators, the man-hours of products are underestimated, etc. Such arguments in most cases are far-fetched. We do not tire of reminding workers in the technological service and specialists working in shops: "The most important thing in the final account is higher productivity of labor and lower production costs of the products."

Embrace All Links

The levers of technical progress cannot be subdivided into primary and secondary. All of them are important. Neglecting these or others may weaken the economic effect of technical progress in production.

Let us take the making of the sizes of intermediate products closer to the to the parameters of finished products. Everywhere this is a profitable direction of progress, amounting, in some cases, to "trifles." But in each case, such improvement in technology leads to saving metal and reducing the volume of machining. If the intermediate product is made "poorer," this shows up immediately in reduced saving for the plant as a whole.

Up to a hundred products are changed over every year in shops to precision casting. On each of them a number of machining operations is reduced. We are introducing metal shell mold casting on a wide scale. A metal powder section was placed in operation. Therefore, another source of saving labor and material was opened up.

Such an improvement is sometimes a convergence of preparatory and machining processes and the development of equipment and technology are related to progressive changes in the organization of production. And, of course, in any link of innovation, it must be tested from the economic standpoint.

I would like to stress the role of plant economists. They come forward here not simply as consultants and analysts, but as a praiseworthy addition to strive to increase the efficiency of production. Moreover, they indicate available possibilities and improve planning.

I will cite only such internal reserves under conditions of small series production, as partial start-up of parts or manufacturing them by means of group set-ups and accessories, which reduces labor by several times and accelerates the machining of the intermediate products. In group set-ups, milling-centering and other metal-cutting machine tools are used successfully for the production of various products.

Sets were created at the plant with the participation of scientists of rapidly readjustable technological accessories for turning a number of models with semiautomatic machines and machine tools with ChPU. Thereby we were able to load the equipment more fully and expand the number of kinds of parts being machined. By the way, these sets were designed in cooperation with the industrial scientific research institutes, VUZ departments and academic institutes.

The creativeness of plant innovators is exceptionally fruitful. In the last two years they introduced more than 1000 suggestions on improving production, including 26 inventions. The suggestions are being basically implemented and save the plant over 300,000 rubles annually.

Technologists I. Limanovskaya and L. Novikova, for example, developed an original method for manufacturing several kinds of parts which saves 760

kilograms of plastics annually. Designer P. Vasil'yev, having improved a unit of lifting devices, reduced steel consumption by 50 tons. The tireless innovator setter-up, A. Kharlamov, found ways to use production wastes and make over 6000 rubles worth of products from them per year. Managers, the party committee, the trade union committee and Komsomol Committee support the leading workers in every possible way and disseminate their experience in socialist competition for raising the efficiency of production.

According to Plan, Systematically

A clear-cut operating system is required to uncover and utilize most fully the possibilities of scientific technical progress. The general orientation is given by a plan of economic and social development of the plant and within its framework -- by the target programs.

How do we tie the technical and economic prospects in with the social development of the collective? A cycle of a sort began in April-May with the development of a plan of organizational-technical measures for the following year. First the goals and divisions of the plan and the people responsible for their formation are determined; schedules for shops and services; date of plant economic-technical conference to consider the plan. The preparation of the accounting and business machinery plan is headed by a commission chaired by the chief engineer.

The accounting and business machinery plan in its turn serves as a basis for the developed plan for raising the technical-economic standards of production. Every other Thursday of the month, representatives of interested subdivisions report to the chief engineer. The implementation of the accounting and business machinery plan in shops and services is monitored twice a month by the deputy chief engineer for new equipment.

Organization-technical measures are strengthened and substantiated economically. The progress of tasks on new equipment is evaluated in competition between the subdivisions every quarter according to a point scale by an accumulated total. And again not simply by the amount, but depending upon the economic effect.

Bonuses to shop and service collectives depend on the actual reduction in production costs and manpower, meeting the product list of the state plan and ministry targets, and supplying products according to contract obligations. The following are taken into consideration additionally: implementation of the accounting and office machinery plan and raising the technical and economic standards of production; introduction of innovator suggestions and inventions; product quality; standard of labor and safety engineering.

Final results are best judged according to a direct (and not conditional) economy of means by improving equipment and technology. A fairly considerable share in the reduction of the production cost -- hundreds of thousands of rubles is due to this factor. Labor intensiveness of production is reduced every year by five to seven percent.

The five-year plan of the plant is being implemented by modernizing production facilities which causes considerable difficulties. But the collective overcomes them successfully and maintains the given rates persistently. This year all plan-economic indicators are being fulfilled. Mobilization of reserves is being continued.

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SPECIALTY PLANTS TO REVIVE ESTONIAN METAL WORKING INDUSTRY

Tallinn IZVESTIYA AKADEMII NAUK ESTONSKOY SSR: OBSHCHESTVENNYYE NAUKI in Russian No 3, Vol 32, 1983 (signed to press 30 Jun 82) pp 206-215

[Article by Kaarel Kil'vits: :Auxiliary Production of Metal working Type in the Estonian SSR]

[Text] Material production of a metal-working type is divided into basic, that manufactures products for sale, and auxiliary production that services basic production. Auxiliary production is low yield from the standpoint of creating consumer values. However, it is very necessary to provide continuous functioning of basic production.

The functions of basic and auxiliary productions lend themselves to clear-cut demarcation, but in the production-economic sense they form a single whole. Certain proportions were formed between the basic and auxiliary productions, with the volume of the second being determined by the volume of the first. The economic efficiency of production as a whole depends on the correct proportions of basic and auxiliary production. Their violation leads to a reduction in economic effectiveness. Such a situation originates when auxiliary production development lags sharply behind the development of production. This phenomenon has been observed in the Estonian SSR industry since the end of the fifties when basic production began developing especially intensively.

Auxiliary production remained in the secondary position inasmuch as capital investments in it do not lead to a direct increase in the final product.

However, it should be noted that forcing capital investments into developing only basic production unavoidably involves a slower growth of auxiliary production and, therefore, its falling behind growing requirements, i.e., resulting in a scarcity of services. The latter attests to the imbalance between basic and auxiliary productions.

The scarcity reflects negatively on everything. If it manifests itself in intraplant auxiliary work, then the process of basic production is disrupted and idle times, irregularity of operation etc. originate. As far as the scarcity of services for the specialized capacities of auxiliary production (repair and tool plants) is concerned, first, it diffuses this production (each enterprise considers it more reliable to do all the work with its own

forces regardless of unsubstantiated high costs) and, secondly, permits the specialized enterprises of auxiliary production to dictate to the consumer the cost and conditions for doing the work. This is not at all a rarity in the practice of departmental mechanical-repair plants. Reserves of scarce resources (spare parts, tools etc.) exceeding current requirements are increasing at enterprises. There are uncontrolled exchanges of scarce resources between enterprises and the supply center and inefficient traffic increases.

No attention is being paid to these negative phenomena when forcing the development of basic production and no consideration is given to the fact that the disproportion in the development of the basic and auxiliary production will sooner or later hold back the growth of the first, but then removing the disproportion may turn out to be more costly. Considerable resources are unavoidably concentrated in an auxiliary production of basic enterprises which, however, under diffused conditions are utilized inefficiently.

In 1980, 22.2% of the total number of industrial workers (including those in auxiliary production and the kolkhoz industry) were occupied in repair work in the Estonian SSR. Repair facilities of machinebuilding and metal-working in the republic were studied in detail; according to 1980 data, 13.9 percent of the total number of workers in the sector were occupied in these facilities, and 10.2% of fixed production capital was utilized. A total of 17.3% of metal-cutting machine tools were installed in repair shops and repair sections of basic shops in the sector.

Doing repair work under primitive working conditions requires a large amount of labor, especially in making spare parts. If the labor expenditures of repair workers per unit of repair complexity exceed the man-hours norm by 10 to 50%, then in making spare parts the actual man-hours of machine tool work exceeds the norm by 1.2 to 2.0 times. This situation is due to the fact that in centralized procedures, enterprises obtain only about 10% of the spare parts they need, while the wear resistance of the spare parts of their own manufacture is low because of the use of imperfect technology (lack of heat treatment and possibility of coating parts with wear-resistant materials) and they must be replaced frequently. The cost of repairs made by the forces of enterprises is 1.1 to 1.9 times higher than the norm. For this reason, in 1980, in machinebuilding and metal-working of the Estonian SSR, about 4.9 million rubles were overspent on all types of repairs. On the basis of previous investigations it may be concluded that in the last 15 years the situation in the repair sector has deteriorated somewhat more.

Specialized repairs of metal-working equipment did not receive proper development in the Estonian SSR. When, in 1960, a specialized shop for capital repairs and modernization metal-working equipment was created at the Baltic Ship Repair Plant, it was planned to bring its volume of production to 800,000 rubles in 1965. In 1966 to 1970, it was also scheduled to build a new modern repair building. But in connection with the reorganization of the industrial management on the sector principle, the Baltic Ship Repair Plant became subordinated to the USSR Ministry of the Fish Industry and interest in repairing metal-working equipment for other enterprises of the republic was lost. Although the indicated shop still exists, it cannot make a significant contribution to the repair of metal-working equipment. The "Estremrybflot"

Production Association is not interested in preserving the given shop and has petitioned for its closing many times.

Problems of specialization and concentration of repair work on metal-working equipment were entrusted to the "Soyuzstankoremont" All-Union Association at the USSR Ministry of Machine Tool Building and Tooling Industry . But the low production capacity of this association at present allows the meeting of only 4% of the annual volume of capital repairs of metal-cutting machine tools. According to forecasts for average-urgency prospects, the association will not attain, in 15 to 20 years, the necessary size to help enterprises of its service region fully. Therefore, at present, one should not count on help from the "Soyuzstankoremont" Association for awhile. Each economic region, each union republic must organize repairs of technological equipment of machinebuilding and metal-working with its own forces. Our nearest neighbors -- the Latvian and Lithuanian SSR -- have already created specialized capacities to repair metal-working equipment and have reduced labor considerably and the material costs for this work. The solution of these problems in our republic should be accelerated.

Sectors not related to metal-working have always encountered difficulties in organizing repairs of technological equipment and manufacturing nonstandard equipment. Ministries and departments attempted to overcome them partially by creating specialized departmental mechanical repair plants.

Most of these plants originated at the end of the fifties combining small metal-working workers cooperatives and shops. Since, in the last 17 to 20 years, production areas of the greater portion of such enterprises has not expanded (with the exception of the "Teras" and "Progress" plants), they remained territorially broken up into many small production subdivisions. In the first years of their existence they actually served as specialized repair bases of its system: they repaired technological equipment of basic enterprises and manufactured nonstandard equipment and spare parts. But with the passage of time, the share of repair work in the gross output of departmental specialized mechanical repair plants was systematically reduced and is now only 10 to 20%. At present, manufacturing commercial products for sale is in first place. Investigations show that the profitability of repair work with considerably more man-hours of 40 to 50% is second to the profitability of new products. Thus, a reduction in the share of repair work in the plans of specialized mechanical repair plants is due to the production-economic interests of the enterprises. This is also confirmed by managers of the indicated enterprises.

From the national economic viewpoint, one cannot be reconciled with the existing situation. Mechanical repair plants achieve good production indicators, but their basic problem -- repairs of equipment of enterprises of their own system -- recedes into the background. As a result, customer enterprises are forced to repair their own equipment in poorly equipped repair shops with excessive increases in the costs of labor and material.

An unsatisfactory condition is also observed in the organization of tool production. The tool-making facilities of machinebuilding and metal-working in

the Estonian SSR were studied in detail. It was found that in 1980 they had 10% of all workers, 10.1% of the fixed production capital and 15.6% of the metal-cutting machine tools of the sector. Economical indicators of tool shops are low. During the past two-three five-year plan periods the situation in the tool-making facilities of machinebuilding and metal-working has not improved.

Technological accessories (compression molds, dies, technological devices, nonstandardized tools etc.) are used not only in machinebuilding and metal-working, but also in other industrial sectors -- plastics, furniture, light etc. In 1980, 71.0% of the technological accessories in the Estonian SSR industry was utilized by machinebuilding and metal-working and 29.0% by other industrial sectors. Some 1400 tool workers are working in nonmetal-working enterprises and a number of such enterprises have tool shops equippped with special design equipment which, however, is used inefficiently with respect to time and capacity.

Specialized production of technological accessories was not given proper attention. The Experimental "Pioner" Accessories Plant (production volume was 2.3 million rubles in 1980) created in 1965, basically meets the requirements of the Estonian SSR Ministry of Local Industry in technological accessories. Other departments are allotted only about 15% of the annual volume of production.

The tool industry plays a most important part in introducing new products and improving technology. It is generally known that when a strong and technically well-equipped tool shop is available, the rate of scientific-technical progress at enterprises is high. At the same time, many examples may also be cited where designers and technologists found an interesting technical solution, but the insufficient capacities of the tool facilities made it impossible to manufacture the necessary amount of equipment for the rapid introduction of a technical novelty. In 1980, the Estonian SSR industry felt a scarcity of technological accessories to an amount of 5.05 million rubles.

Technology is improving at an accelerated rate and new materials are being assimilated in the tool industry. In the last 12 to 15 years, hard alloy powders began to be widely used primarily to manufacture dies for mass production. During the operating life (until fully worn) of carbon steel dies, 30,000 to 50,000 parts are manufactured. The operating life of dies from hard alloy powders is 10 to 12 times as great. Regrettably, dies made of hard alloy powders are also very scarce because there are not enough production capacities for their manufacture. For example, in 1980, various ministries and departments requested these dies in the amount of 1.2 million rubles, but actually received only 0.48 million rubles worth, i.e., 40% of the requirements. The reason is that we do not have an industrial base for manufacturing hard alloy dies, and their production is too difficult due to the complexity of the technology. The Scientific Research and Technological-Project, Institute of Planning and Management Systems in the Electrical Industry of the Tallinn Electrotechnical Plant imeni M. I. Kalinin, and the tool shop of the "Vazar" Production Association cannot meet fully the industrial requirements for these dies.

In order to eliminate the scarcity of technological accessories by 1990 and reduce considerably the share of their own tool shops of enterprises in manufacturing production tools, it is necessary to achieve a very high rate of increase in the specialized tool industry. The possibilities of expanding the experimental "Pioner" Accessories Plant on its present territory are limited: in 1981-1985, it is planned to increase its capacity to 3 million rubles (an assembly production hall will be erected). According to estimates, the output volume of the plant (within Tallinn) can be increased only to 4.7 million rubles by 1990. Moreover, labor shortage impedes expansion of production in Tallinn. The "Estonpromproyekt" State Design Institute designed a new accessories shop with a planned capacity of 3.5 million rubles per year in money terms (first stage in 1985) for the "Pioner" plant. The shop will be erected in the Lasnamyaeskiy industrial rayon, but releasing it for operation is considered only a first step in solving the problem.

The large economic effect of specialization and concentration of auxiliary production is stressed by many scientists-economists. In the Estonian SSR many investigations (E. Kull', K. Eygi, M. Berner, V. Rayangu and others) have been carried out is this area. Why then have commonly acknowledged forms of social division of labor and organization of auxiliary production not received proper consideration? There are objective and subjective reasons for this. On the scale of the republic they may be reduced to the following: 1) a large departmental fragmentation in Estonian SSR industry (especially machine-building and metal-working) and resulting departmental barriers and approaches to the specialization of repair and tool works: 2) insufficient centralized provision of spare parts and technological accessories and a shortage of specialized repair and tool-making capacities subordinated to the union republic; 3) limited capital investments and construction capacities in the republic; acute labor shortage in the republic.

The last point requires clarification. Specialization and concentration of auxiliary work of metal-working type, as a rule, facilitates the reduction in labor shortage. But before the economic effect from specialization and concentration is achieved in the form of reducing the number of workers and material expenditures, it is necessary to create specialized production facilities (a plant or shop) and provide them with workers and equipment. But until the present time the shortage of labor counteracts the creation of such specialized production facilities. Also frightening is the so-called transition period when specialized enterprises have already recruited the labor but the basic production enterprises still do not start reducing the number of auxiliary workers. In this connection, it is necessary to attend to still another circumstance. Specialization and concentration of repair and tool work will produce the desired effect only when the created specialized enterprises have sufficient capacity. And only after having been convinced of the active help of the new specialized enterprise of auxiliary production, will basic production enterprises undertake to reduce the number of auxiliary workers.

However, according to statistical data, the rapid increase in the number of auxiliary workers in productions of the metal-working type continued in the 9th and 10th Five-Year Plan periods. It was necessary to create new working positions which required large additional capital investments. Briefly, in 1971-1980, auxiliary production facilities of the metal-working type absorbed more additional capital investments and labor than required by the specialization and concentration of such work.

Due to the violation of the proportions between basic and auxiliary production the entire machinebuilding and metal-working structure for three consolidated productions -- primary, auxiliary productions and the kolkhoz industry -- leaves much to be desired (see Table 1).

Table 1

Structure of machinebuilding and metal-working in the Estonian SSR in 1980

Types of production	Ratio, %		
	Gross output	Number of industrial workers	Fixed industrial production capital
Basic production	79.6	72.7	67.9
Auxiliary production	12.0	17.4	19.0
Kolkhoz industry	8.4	9.9	13.1
Total	100.0	100.0	100.0

Data in Table 1 show that in 1980, 27.3% of all workers were employed in auxiliary production and the kolkhoz industry of a metal-working type put together, and 32.1% of fixed industrial-production capital was used in machinebuilding and metal-working. But, at the same time, they produced only 20.4% of the gross output of the sector. Such proportions between consolidated productions are inefficient.

The problem of making auxiliary production of a metal-working type more efficient is outside the framework determined by the USSR TsSU [Central Statistical Administration] for machinebuilding and metal-working. The problem we are studying concerns almost all sectors of industry. The situation is that besides machinebuilding and metal-working, many small productions in small industrial enterprises are involved in metal-working in the Estonian SSR which, according to the USSR TsSU methodology, are counted in the composition of the basic production of their sector. Taking this into account, the total number of workers involved in metal-working of various types in the national economy of the republic is 29.7% greater than the number of workers in machinebuilding and metal-working. Here large labor reserves are hidden.

In studying the internal sturcture of workers involved in various types of metal-working, the following points must be taken into account:

1) repair and tool plants are among machinebuilding and metal-working enterprises which, according to the USSR TsSU methodology, represent basic productions but, according to the viewpoint of a given department and the national economy as a whole, they are auxiliary;

2) repair and tool workers in machinebuilding enterprises in an independent balance are also involved in the auxiliary work of metal-working type. These workers, according to the USSR TsSU methodology, are also considered as basic although they do work of the auxiliary type;

3) various productions of the metal-working type, created in nonmetal-working sectors, manufacture tools, metal products, consumer goods etc. Such activity does not service basic production and, therefore, cannot be considered auxiliary. In our opinion, this is collateral production, actually fulfilling the function of basic production in machinebuilding and metal-working. The difference between them consists only in administrative subordination; therefore, their classification is artificial. The reason for the existence (and regrettably, for the constant expansion) of collateral production of the metal-working type is that machinebuilding and metal-working enterprises cannot meet the constantly increasing and structurally changing requirements of the national economy. The organization and expansion of collateral production are brought about by the necessity of fulfilling the production plan of its own enterprise (or entire system), in spite of supply shortcomings, or the desire to utilize the existing scarcity and market conditions to improve its own indicators.

The problem of collateral production of metal-working type is especially urgent with respect to kolkhozes which produced an entire theory to explain and justify their actions: the kolkhoz labor force is better utilized, the money received is used to expand agricultural production and the "bride problem" is solved. But all these arguments do not hold water. To keep women in the village or attract them to the village, it is not necessary to create collateral productions of the metal-working type whose output is not used to meet the needs of agriculture or local needs. Why create in the village or settlement machinebuilding and metal-working production that manufacture products not needed in the village. This only diverts work forces which are short in the village anyhow. The village, on the contrary, very much needs a confectioner's shop, a tailor shop, a shoemaking shop and everything else that enters into the "infrastructure" concept. Collateral production of the metal-working type has no prospects in kolkhozes. In fact, the scientific technical progress in industry proceeds at a rapid rate and the kolkhoz, not having a corresponding experimental and design base, is incapable of assimilating new equipment and technology and, therefore, will doubtless lag behind state specialized production facilities. The basic reason for small administrative limitations with respect to the collateral production of a metal-working type in kolkhozes is that their output, as a rule, is in great demand. The approach principle is simple: better such a production facility than none at all. However, collateral production of a metal-working type basically takes manpower away from specialized machinebuilding and metal-working enterprises. And the materials are not only production wastes -- in the end they are obtained at the expense of specialized production. Thus, on the one hand,

collateral production of a metal-working type seemingly reduces specialized production and, on the other hand, slows down specialized production and increases the scarcity. From the purely technical viewpoint, organizers of collateral production in kolkhozes are worthy of all kinds of respect. On such an artisan production level it is not easy to produce that which is difficult to cope with by a large specialized industry. One may only be impressed with their organizational and procurement talents. However, from the viewpoint of the state as a whole, this production cannot be considered justified. It does not have the final national effect. The problem of kolkhozes is producing agricultural products (of fishing kolkhozes -- catching fish) and not, for example, electronic equipment. Enterprises of several kolkhozes involved in such production have found that their possible liquidation may be a very painful process. What to do with buildings, equipment and highly skilled manpower? It is suggested even to transfer these enterprises to a department of corresponding industrial ministries. However, the territorial disposition of these enterprises does not permit the development of production. This might be a repetition of what happened when the machine-tractor stations were liquidated: eight new instrument-building and electrical equipment plants and shops were created on their bases which, in the overwhelming majority of cases, were unable to become viable enterprises;

4) kolkhoz industry of a metal-working type may be considered as the sum of auxiliary and collateral production of a metal-working type in kolkhozes. This is a subdivision according to kolkhoz property, but not according to the function being fulfilled.

The classification of the production of a metal-working type that we use in this article is shown in the following arrangement.

Basic production of machinebuilding and metal-working	Lateral production of metal-working type	Auxiliary production of metal-working type
	Kolkhoz industry of metal-working type	

Structure of production of metal-working type.

The distribution of the industrial personnel in the indicated structure is shown in Table 2.

Even if it is taken into account that 9.2% of the repair workers were employed in the production of nonstandardized equipment and other metal products, i.e., actually in manufacturing new products while workers of collateral production -- only in manufacturing new products, the following may be stated. Only 36.6% of the workers employed in metal-working of various types in the national economy of the Estonian SSR produce new commercial products. The remaining 63.4% are employed in repairs (55.9%) and manufacturing tools (7.5%).

Attention should also be called to the fact that due to the lack of authentic statistical data we are not taking into account the repairs done by the basic workers. But, according to estimates by experts, about 10% of the working

time of chauffeurs and mechanics is spent on repairs. Taking this into account makes the total picture considerably worse.

Table 2

Structure of industrial personnel employed in metal-working of various types in the Estonian SSR in 1980.

Types of production	Ratio, %
Basic production of machinebuilding and metal-working	27.6
Auxiliary production of a metal-working type	69.0
including:	
repair facilities*	61.5
tool-making facilities	7.5
Collateral production of metal-working type	3.4
Total	100.0

*Without repairs done by basic workers.

Improving the production structure of machinebuilding and metal-working is very important as a way to meet the needs of the national economy more fully in the products of this sector and accelerating scientific technical progress. Materials of the 26th party congress direct: "Implement progressive shifts in the structure of the national economy, improve interindustrial and intra-industrial proportions..."[1]

The main condition for making the production structure of machinebuilding and metal-working more efficient is the establishment of efficient proportions between basic and auxiliary productions, as well as the distribution of production resources between them efficiently based on their direct functions. The solution of this problem depends on specific scientific conclusions which may be formulated as follows:

1) the policy of orientation toward the consumer, stressed by the last party congresses, cannot be achieved by converting the consumer into a producer. This may lead to further expansion of the natural industry in machinebuilding and metal-working;

2) in its essence, auxiliary production is called upon to service only basic production and cannot be used to manufacture scarce labor tools and consumer goods, i.e., it must not be converted to collateral production. Meeting the requirements of the national economy in labor tools and consumer goods is a problem only for specialized state basic production;

3) it is necessary to slow down the unsubstantially high, from the economic viewpoint, development rates of auxiliary production of the metal-working type and reduce the ratio of auxiliary production in the total industrial production to a size necessary to fulfill direct functions by specialization and concentration of labor-consuming repair and tool-making work.

[1]Materials of the 26th party congress. Moscow, 1981, p 137

4) liquidate gradually collateral production in machinebuilding and metal-working in kolkhozes and transfer it to specialized state enterprises. Collateral production of a metal-working type, that satisfies their own requirements, is expedient to preserve as long as specialized state machinebuilding and metal-working are not in a condition to meet national economic requirements fully.

The solution of these problems is tied to certain difficulties. First, specialization and concentration are hindered by departmental dissociation which, at present, is difficult to overcome. Second, the work force employed in small production facilities is tied to a certain place of residence, i.e., is immobile. Third, workers in repair shops and collateral production facilities of sovkhozes and kolkhozes participate in field and harvest work in the summer months. Such a combination is even a good thing. But under conditions of a constantly growing scarcity of manpower, further expansion of small auxiliary and collateral production and diffusion of labor forces and equipment cannot be permitted because this, in the final result, can disrupt large basic production and slow down the growth of its efficiency.

Traditional planning is oriented toward the sectors of the national economy or their subsectors (sector principle) and to territory (territorial principle). Such planning lacks depth; in several problems it remains superficial, especially in the solution of interindustrial key problems to which, undoubtedly, repair and tool sectors belong.

A comprehensive, systematic approach to adopting plan solutions becomes more and more important. It would facilitate the raising of the level of balancing and optimizing plans, be oriented toward increasing savings; all-around intensifying production, and raising further the efficiency and quality of work. One of the tools for achieving a comprehensive approach to planning is system analysis. The use of methodology and the method of system analysis makes it possible to expose the interrelated totality of all necessary measures (scientific technical, production, organizational, economic and social). By using systematic analysis it is possible to develop individual full-scale programs, determine targets and the structure of the program itself and the combination of the most effective measures for its implementation. In order to eliminate the disproportions in the development of basic and auxiliary production, it is necessary to intensify territorial and regional planning by means of the target-programed method whose skillful utilization should provide all-around success in the national economy.

2291
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AVIATION INSTITUTE DESIGNER ON NEW TECHNOLOGY LAG TIME

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Jul 83 p 1

[Article by designer Yu. Voronov, Planning-Design Technological Institute of the Ministry of Automotive Industry (Gorkiy), under the heading "The Floor to Designer Yu. Voronov": "Fate of the Plan"]

[Text] When visiting plants, I sometimes see idle machine tools, machinery and sometimes even whole automated lines in the shops. Everyone probably thinks, when he sees this, about the enormous expenditures, material and labor, invested in this equipment. But I, as a designer, am especially offended for my colleagues. Who can say how much effort was put into that unit, how many times a particular subassembly had to be reworked until the one truely optimum resolution was found. And all for naught.

You don't have to look far for an example. For nearly a year, a group of our designers worked to develop an automated line for assembling passenger car radiators. It was innovative in that it for the first time made it possible to manufacture radiator "stuffing" out of aluminum rather than expensive copper. We finished the work on time and sent the line to the customer, a radiator plant in Likhoslavl, Kalinin Oblast. We expected the innovation to be put to work right away, but the line has sat idle for more than half a year now. It turns out that some one, for some reason, changed the radiator design without letting either the manufacturing plant or the developer of the equipment know about it, so now, the automatic line apparently can't be used anywhere.

How could this happen? This is something I think we should think seriously about. I have been a point man [designer] for more than 10 years now. Our institute designs new equipment which is used to test parts, subassemblies, units and all brands of vehicles being produced by the country's automotive industry. The design collective has been set a precise task: develop equipment capable of reducing testing time to a minimum. And truth be told, we have coped rather well with this task. A majority of the innovations we have developed have been very economical, freeing people from performing manual work. Several developments have been certified as inventions, exhibited at the USSR Exhibit of National Economic Achievements, and awarded certificates and medals.

In spite of this, however, our designers are not always convinced, when they undertake their next task, that their offspring will take shape in metal, that the blueprints won't gather dust on the shelves. And for good reason. Judge

for yourself: over the last five-year period, only 153 of the 260 pieces of equipment developed by the institute have been accepted by customers for industrial manufacture; that is about 60 percent. A similar ratio has been retained during the first two years of the current five-year plan. And so it happens that 120 of our 300 designers are running constantly in neutral. And need we mention that any innovation is not easily born. Many days, weeks and even months pass before an idea takes shape in an actual blueprint which can be used to manufacture a machine tool or piece of machinery. And what torment to know that this labor is spent in vain, that your development is condemned to sit for years waiting its turn.

I know for a fact that designers in many other branches are also in a similar situation. For various reasons, apparently. I should like to touch on one of them, to speak about the customer's responsibility.

Again, I'll use a concrete situation. At the insistent request of the leadership of the Kremenchug Motor Vehicles Plant, ten of our designers developed a test stand for running in trucks. They worked for several months, forsaking rest, as the customer was in a hurry. And for good reason. With such a test stand, all vehicle tests could be run under plant conditions. It would no longer be necessary to keep a staff of drivers or to use fuel. Then the blueprints for the original new design were ready. Its introduction would yield a savings of half a million rubles to the state. The next thing was to manufacture the stand in metal. Under the terms of the contract, the plant assumed that part of the work itself. Suddenly its leaders cooled towards the innovation. Why? It turned out that the enterprise found more urgent tasks, and introduction of the test stand was put off until later. We have been trying for more than a year to persuade the customer to finish the job.

The root of the problem, it seems to me, is that the institute's plans, which are drawn up on the basis of enterprise orders, often have included in them projects which are incidental and of secondary importance to those enterprises. In other words, customers make up their orders on the off chance that things will come in handy sometime. The time comes when the order has been filled, and what are actually more urgent and important tasks come to the fore. How else to explain the fact that blueprints for a a wedge-shaped rolling mill sat, motionless, for many years at the Tutayev Diesel Plant? It was only after 10 years that this mill, which permits machining parts using waste-free technology, was put into operation. And the Lvov Bus Plant also failed to begin manufacturing a test stand for running in vehicles, although the institute gave it all the documentation seven years ago. And the explanation is the same: the test stand was overshadowed by top-priority tasks. This, while the designers at one time literally had people yapping at their heels, pressing them to finish the work.

Some might object that there is such a thing as contract discipline, that violators should bear responsibility. But that is precisely the point, that it is generally the developer alone who bears full responsibility for this. He is held strictly accountable if an order is not met on schedule. Moreover, the designer's work is now evaluated based on end results, and both his moral and material incentives depend on whether his development reaches production or gathers dust in the archives. But customer enterprises are essentially not

answerable at all; it costs their leaders nothing to prove to the ministry that work done by the institute can be expected. In any case, I don't recall a single instance of this kind in which a customer-plant leader has been punished for violating implementation discipline.

And consideration must also be given to the fact that our institute is working basically on orders from enterprises in the same ministry we are in, the Ministry of Automotive Industry. But what about designers dealing with customers from other branches. The path a new machine follows from development to introduction is then impermissibly long. Is it in fact normal for an innovation to begin series production after a delay of 3-4 years? We are accustomed to considering this optimal, but in a majority of instances this period doubles and triples through the customers' fault. Clearly, a development becomes obsolescent in this case, and designers must sometimes return to it and continue working on it. Both creative effort and state funds are spent uselessly.

Under such conditions, it turns out that it is not enough for a designer to be able to develop new machines. He must also, as they say, have punching power, be able to push his development into series production. And so, he must assume duties which are by no means creative: writing letters, telephoning and traveling to enterprises, requesting, reminding, nudging.... The outlays on this, both moral and material, are considerable. And can a person really derive satisfaction from his work if he sees that his labor yields no return, is of no benefit to people? Of course not. And so specialists are leaving the institute. For example, turnover at our collective of designers is 20 percent annually. Skilled, intelligent engineers are leaving. And whereas the profession of designer was considered a very prestigious one and VUZ graduates fought to get jobs in it when I began working at the institute, the picture is different today. And how could it be otherwise, when the specialist runs up against the situations I have described time and again.

It is obviously time for branch leaders to pay serious attention to the state of affairs in the subordinate institutes, to find out why their developments often travel so thorny a path to production. The achievements of domestic machinebuilding are now higher than ever before. But at the same time, it is no secret that the introduction of many scientific discoveries and design developments advantageous to the national economy is often held up by the irresponsibility of those for whom they are intended. Our party stresses that the outstripping, comprehensive growth of machinebuilding and significant improvement in the machinery and equipment being produced have been and remain the mainline of heavy industry development, of strengthening its transforming role in expanding and fundamentally modernizing [fixed] assets in all branches of the national economy. The June CPSU Central Committee Plenum stressed once again the enormous amount of work facing us in developing the machinery, mechanisms and technologies for today and tomorrow. The importance of this task needs to be recognized equally by both the developers and manufacturers of equipment. We need to hold strictly answerable, as a matter of principle, those who retard technical progress. Discipline, after all, determines order in everything, and the accelerated introduction of valuable design developments into production also depends largely on it.

11052
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NEW MACHINE TOOLS, PRODUCTIVITY GAINS AT MINSK PLANT DISCUSSED

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 8, Aug 83 pp 40, 41

[Article by V. Revyako, editor of the large-circulation newspaper "Kirovets" of the Minsk Production Association of Broaching and Cutting-Off Machines imeni S.M. Korov: "Automatons Have a Mission"]

> [Text] Ih 1982 the collective of the pilot production plant, the Minsk Production Association of Broaching and Cutting-Off Machines imeni S.M. Kirov, increased its production volume by increasing labor productivity. It surpassed the plan by producing 12 special highly productive metal-cutting machine tools. Products with the Seal of Quality composed over 50% of the total production volume.

Competititon at the association's enterprises is expanding under the motto: "In the union of science and production--domestic machine tools have a high level of automation and competitive ability." In order to facilitate matters they created an initiative group, composed of head designer S. Glekov, and leading designers and department heads D. Kruts'ko, V. Tsegel'nik, V. Futlik, N. Shnitman and G. Bulankov. Under the direct control of the initiative group, they worked out a complex plan of undertakings of the collective of the Machine-Tool Design Office for the 11th Five-Year Plan, providing for the development of a new range of broaching machines. They also determined the co-implementing departments and work deadlines.

Much of the planned work has already been completed. In particular, they developed four models of a new line of broaching machine with a maximum tractive force of 25 tons and broaching speed of 12 meters per minute. In April 1983 two models were put into serial production. They began production of horizontal and vertical broaching machines 7534 and 7633, which match the best foreign models in productivity, weight, accuracy, degree of mechanization and automation, technological potential and peripheral equipment, convenience of service and control, quality of finish and other indicators.

The issues of raising product quality have been widely reflected in the plant's technical development plans. For example, an automated metal-cutting section came on stream in the forging metallurgical shop.

It is equipped with five internally produced automatic circular saws and power press roller tables for feeding metal bars, bins with storage compartments for spare bars, and other devices. The manipulator crane has both push-button and automatic control. In sum, the easier the work of the service personnel, the higher the production standards. Labor productivity in metal cutting has increased 1.5 - 1.7-fold.

Machine tools with numeric program control are being used increasingly more widely. Currently more than 930 parts descriptions are being machined with them. It is proposed to transfer 90 percent of machinable parts into the "hands" of machines by the end of the Five-Year Plan. In the welded metal structures shop forgings are now being cut out by machine with a photocopier device instead of manual marking and cutting. As a result, all complex parts of both serial and unit machine tools are being cut out without using manual labor. Semi-automatic welding machines for welding in a carbon dioxide gas atmosphere and guillotine knives for cutting sheet metal with thicknesses to 32 mm were also introduced. An edge-bending machine and plasma cutting machine with program control, and a milling planer for stamping of parts, which eliminates parts stamping in the mechanics shop, came on stream.

In order to give a continuous-flow character to machine-tool construction--a traditionally individual and small-scale production--complex-mechanized lines and sections were created in a number of shops. A permanent list of products was assigned to each of them. 12 of these lines were assembled in the main building. This made it possible to mechanize many production processes and introduce advanced technology. For example, a line for mechanically processing 20,000 straps was introduced in the shop for machining of base and casing parts, and a line for processing more than 30,000 gear wheels was introduced in the cutting-out machines shop. Special equipment, highly productive outfitting, ground-type transport, multiple packaging materials, etc., are being used here. All these elements of organization of the technological process are also being widely used in other production sections.

Special and specialized machine tools of internal production were also introduced in the association. Their efficiency is also high. Thus, the introduction of a semi-automatic broaching machine for surface broaching made it possible to replace three horizontal millers and free five machine-tool operators. The annual saving was 30,000 rubles. A standard drilling machine with program control, on which 46 types of straps can be machined, increased labor productivity 5-fold. The nation's first equipment complex of three special machine tools for roughing of gear-box openings was introduced at the pilot production plant. This made it possible to reduce the labor consumption of producing cutting-out machines by 600 quota hours annually and free three workers. The introduction of special internally produced machine tools results in considerable labor conservation. Therefore, it was decided to expand their production in the future. The same may be said about the introduction of special high-speed outfitting, including associated devices for mechanical processing and conveyor lines for assembling the cutting-out machine and its separate assemblies.

Take mechanization of storage management. The plant's main building is equipped with a mechanized warehouse of finished parts and an automated shelving and packaging warehouse for storing standardized articles. The parts are placed in bin compartments by a stacker machine controlled from a console, and unloading-loading operations outside the bins are performed by a roller table, overhead crane, and electro-contact carriage.

The association's innovators have contributed considerbly in all these matters. In the 10th Five-Year Plan, for example, they incorporated 30 inventions and 1170 efficiency suggestions. The saving was $1,468,000 rubles.

In the 11th Five-Year Plan the association's collective plans to achieve an increasingly higher technical level of its machine tools and increase their competitive ability. A new line of broaching machines (45 instead of 25 models can now be produced) will be developed and assimilated. Each model reduces metal consumption by 100-150 kg. Calculated per annual output of machine tools for 1985, the new line of broaching machines will make it possible to free nearly 300 workers, 1.5 thousand square meters of production areas, and save 200 tons of metal. Additional socialist obligations envisage shortening the new line's development time by a year.

At least doubling the quantity of the workable designs of the most highly productive continuous broaching machines will make it possible to save about 2.5 thousand t of metal and free 400 workers and machine-tool operators and 2000 square meters of production areas. The total saving will be 1 million rubles.

The high level of automation of broaching and cutting-out machines will be achieved due to their fitting out with automatic manipulators, unified and standard loading-unloading devices and creation of conditions for multi-machine servicing. The output of automatic machine tools will reach 70 percent of the total amount of special machine tools produced, including up to 90 percent of vertical internal broaching machines and up to 50 percent of vertical surface broaching machines. The further creation and assimilation of vertical broaching machines with numeric program control is also provided for. They will all be outfitted with automatic manipulators for installing and removing machined parts, which will provide an average increase of productivity of 2.5-fold. It is planned to serially produce cutting circular saw machines with numeric program control, assuring a 20 percent increase of productivity. Implementation of the planned measures will make it possible to save nearly 45 million rubles.

Fulfillment of the complex program of technical rearmament will make it possible during the 11th Five-Year Plan to increase labor productivity by 22.8 percent, conditionally free more than 230 workers, and bring the level of mechanization in basic production to 85 percent.

12421
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OTHER METALWORKING EQUIPMENT

CHARGED PARTICLE ACCELERATORS NOW IN ROUTINE USE

Moscow PRAVDA in Russian 17 Jul 83 p 2

/Article by V. Glukhikh, director of the Scientific-Research Institute of Electrophysical Equipment imeni D. V. Yefremov and corresponding member of the USSR Academy of Sciences, Leningrad: "Accelerators Have Moved Into the Shops"/

> /Text/ Charged particle accelerators, which fifty years ago made their appearance as a tool of "pure" science, have in the past ten years taken a firm position in industry. The demand for them is constantly increasing. In brief, the charged particle accelerator has become an instrument of production instead of only an instrument for research.

The currents of accelerated beams and the x-rays and gamma rays that are excited by them can bring about a major rearrangement of the structure and properties of materials. This is why the problems of using accelerators in the national economy and also of further improving them attract the attention of spcialists in a broad range of fields.

At the recently held IV All-Union Conference on the Use of Charged Particle Accelerators in the National Economy, which met in Leningrad, a large number of papers were presented on the analysis of the results of their use in enterprises, on questions having to do with reliability and improving their parameters, and also on the development of a new generation of accelerators. And this can be explained. For example, by increasing the capacity of a single source of radiation it has become possible over the past 20 years by more than an order to raise the productivity of the radiation installations. At the same time the cost of a kilowatt-hour of radiation of accelerators has dropped more than 10-fold, which has made it possible to make technological processes extremely advantageous from an economic point of view. For example, the radiation processing of polyethylene makes it possible to more than half the consumption of electricity as compared with chemical processes. In radiation vulcanizing of rubber the energy outlays are reduced some 10-fold. Sterilization by an electronic beam instead of a chemical beam provides almost a five-fold savings in energy outlays.

Among the assimilated processes the radiation modification of various plastic articles is in first place. Great successes have been achieved in the production of cable and electrical insulation, where the amount of product that is modified using an electronic beam has increased some 20-fold. An economic savings of tens of millions of rubles have been realized. The radiation-technological installations are extensively used in the chemical industry for manufacturing thermoseated tubes, in the textile industry for finishing fabrics. Work is underway on the radiation polymerization of paint and varnish coatings for wood and metal. On the whole the increase in the capacities of accelerator units at the enterprises represents 20 to 25 percent per year. Not many other kinds of equipment are entering the national economy so actively.

The pace of assimilating accelerators for activation analysis and flaw detection is picking up. For this purpose linear, high-frequency accelerators and betatrons are being used for the most part. The production of units for these processes is picking up from five-year plan to five-year plan. The many years of experience in their operation confirms the high efficiency of using such devices.

At the Izhorskiy Zavod Production Association and at other enterprises of the USSR Ministry of Heavy and Transport Machine Building and the USSR Ministry of Power Machine Building, the linear accelerator flaw detector, which has been installed directly on a lifting crane, has become a routine tool. It generates a powerful x-ray, which "probes" the thick-walled housings of atomic reactors and makes it possible to discover hidden imperfections in the metal, which other means cannot detect. It takes 40 minutes to evaluate the quality of a blank for the reactor housing having a wall thickness of up to 600 millimeters. There are no other means that can provide such control.

Electronic linear accelerators have solved a complicated and labor-intensive problem for express analysis of ore samples for gold and other rare metals. A gold-bearing rock passes through on a belt near a radiation source, is activated and becomes a source of a characteristic radiation. Its intensity makes it easy to judge the gold content. It is now becoming an easy matter to detect small amounts of the precious metal in ores containing many different metals. What is more the analysis takes only a minute and can be accomplished almost on a continuous basis.

Accelerator technology is being used in agriculture as well. At the Belorussian Livestock Complex, the Borovlyany, a production check is performed on the technology and equipment that is used to render harmless the discharges of gamma-radiation and fast electrons. The adoption of new equipment on the scale of a complex for feeding 100,000 head of pigs rather than the traditional biological system may provide a savings of nearly one million rubles per year.

The radiation treatment of cotton fabrics is making it possible to reduce their creasing property and shrinkage and also to obtain materials having anti-microbe properties, which are required for hospitals and maternity homes. Fabrics made of synthetic fibers are equal to cotton fabrics after having been radiated for their hygroscopicity; and they preserve a high durability.

The adoption of radiation technology at textile enterprises is making it possible to reduce the consumption of electricity, heat and chemicals, thereby reducing the production cost. Radiation polymerization of paints and varnishes for wood and metal is sharply reducing outlays for electricity, is raising labor productivity, is creating absolutely safe conditions for production, and is not polluting the atmosphere.

The use of accelerators for health care and radiobiology is becoming increasingly important. Specialists at the Tomsk Polytechnical Institute and other institutes in cooperation with medical institutions have developed models of radiation devices and have proposed more rational methods for using them in the treatment of cancer-related illnesses. Particular attention is being devoted to monitoring the characteristics of the radiation field and automating the process of the radiation effect upon the patient. The models of therapuetic linear accelerators that have been designed and manufactured are now being successfully used at several scientific medical institutions. A group of units with an automated control system is being manufactured and will be given to cancer clinics in the Soviet Union and in the GDR.

We must also mention another important field for the use of accelerators - in the production of short-lived radioisotopes for medical and biological research, radiation diagnostics, and several technical applications. Our institute is developing a new generation of cyclotrons, including six multi-purpose units having a broad range of capacities and radiation energy. Intensive efforts are also underway to create new models of accelerators. They will make it possible to assemble units from a small number of standardized modules; the universality of the units is provided by the variants of the devices for the outlet of a beam as it applies to the demands of a specific technological process. The tasks of decreasing the weight, dimensions and use of metal are at the center of the attention of the designers. They are looking into the possibility of combining an accelerator with a computer, which will make it possible to standardize the systems for the control and use of the unit in automated processes.

A great deal of practical experience has been accumulated in using industrial accelerators and in their manufacture; and the foundations for radiation technologies have been created. Thus, one can realistically speak of the establishment of a new sector of technology that is called upon to radically alter many processes and do tasks that could not be done previously.

In the Soviet Union the adoption of accelerators into the national economy was organized through a target comprehensive program, in which several ministries and departments have participated.

At the same time, if one is to speak from the point of view of the future prospects, the present level of the applied utilization of accelerated beams can only be viewed as a modest beginning. For the more extensive adoption of accelerator technology it is necessary to solve several serious scientific-organizational, technical and production problems. First of all, it is necessary to define the fields for the most effective use of radiation technology using accelerators, the basic characteristics of appropriate charged particle beams for these purposes, and to compile sound prognoses as quickly as possible.

For the time being, unfortunately, such research is being conducted on a comprehensive basis in only a few sectors of industry. In the meantime there is every reason to believe in the enormous social-economic benefits promised by the use of accelerators in agriculture, microbiology, machine building, metallurgy, city planning, and in geological prospecting and geophysical research. However, the lack within the Soviet Union of an appropriate production base for the manufacture of accelerators is slowing their adoption.

The problem is that the accelerators for applied application are largely being built by experimental production facilities. This means that even the clearly stated demand for accelerators is being met by less than one half; and accelerators are being delivered without being assembled and without technological production lines.

It is apparent that the development of the capacities of the experimental production facilities and the organization at these facilities of a small-scale production capability could be a local, but useful solution of the problem. The appropriate decrees for this to take place already exist, but construction is proceeding slowly.

To improve the qualitative characteristics of accelerator technology requires the creative cooperation of the specialists from the related sectors of the economy.

The problem of training specialists who are well acquainted with the sectoral technology and who possess the necessary knowledge for designing and operating accelerators is becoming increasingly urgent. With this goal in mind, perhaps the time has come to consider creating branches of the sectoral departments of the institutions of higher learning attached to the institutes that are engaged today in the development of industrial accelerators.

In other words, the solution of problems connected with the development of a promising accelerator technology requires a comprehensive approach and awaits the coordinated efforts of scientists and engineers from different sectors of the economy.

8927
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CHELYABINSK PLANT'S NEW FORGE-PRESS

Moscow EKONOMICHESKAYA GAZETA in Russian No 23, Jun 83 p 2

[Unsigned article: "Largest in the Nation"]

[Text] Construction of the largest Soviet specialized forging-pressing shop is proceeding at full speed at the Chelyabinsk Metallurgical Plant. This shop will produce forgings and high-quality steels for the automotive, tractor and other enterprises. Two hydraulic presses rated at 3,150 tons each are already in operation; these units were fabricated at the Dnepropetrovsk Production Association For Heavy Presses.

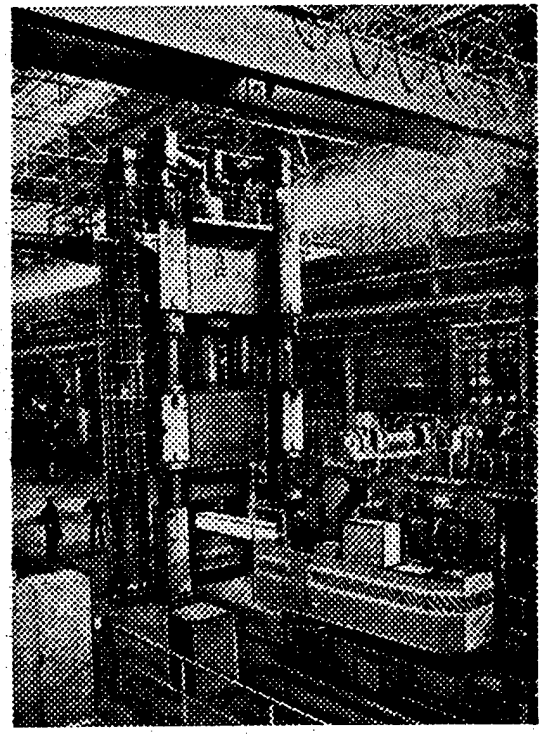

Photo by B. Klipinitser (TASS)

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PLANNING, DESIGNS OF FLEXIBLE MANUFACTURING SYSTEMS DISCUSSED

Moscow MASHINOSTROITEL' in Russian No 2, Feb 83 pp 12-14

[Article by Candidate of Technical Sciences V. G. Serebrennyy: "The Development of Flexible Production Sections"]

[Text] The experience of the operation of flexible production complexes on the basis of multipurpose NC machine tools, especially when machining complex and labor-consuming parts, has shown that owing to the elimination of the time that the parts are between operations, a substantial increase of their production in case of a high degree of utilization of the equipment is achieved by means of the concentration of machining at individual work positions. The analysis shows that the increase of the quantitative output of individual parts does not accomplish the basic task of increasing production efficiency as a whole, but only leads to an increase of the amounts of unfinished production.

Such a situation is explained by the fact that the accomplishment of the specific task of increasing the continuity of the technological process of the machining of parts is not interconnected with the accomplishment of the general task--the assurance of the continuity of the entire production process. To a great extent the lack of a comprehensive approach to the solution of the problem of the development of efficient machine tool complexes at the stage of designing is the cause of this.

New technical approaches, which are connected with the design decisions of the machine tools of the complex, its technical characteristics and the control system, are developed at times in isolation of the analysis of the operation of the given machine tool as an integral part of a previously specified integral technical system. In case of such an approach the basic characteristics and the technological potentials of the machine tools, which are connected with the high speeds of the operating and idle transfers, the possibilities of the intensification of the cutting conditions and other parameters and which are achieved by means of the substantial complication and increase of the cost of the designs, do not yield the anticipated impact under real operating conditions. As a result frequently a paradoxical phenomenon is observed, in case of which the conducting of a set of studies, which involves the determination of the area of their efficient use, begins only after the development and the launching of the series production of new models of NC machine tools.

The thorough and exhaustive coverage of the entire process of the machining of a specific set of parts for the achievement of the optimum productivity is the basic

task of designing. The equipment, technology and organization of production are established at precisely this stage. Therefore incorrect decisions or errors, which have been made during designing, during the further operation of the equipment are difficult to correct and do great harm to the national economy.

At the same time the limitedness of capital investments requires the elaboration of a design, which ensures with the minimum capital expenditures the most economical technological process, composition of the equipment and degree of its automation under the given conditions. The settlement of the question of the advisable level of the automation of equipment along with other directions of development, such as standardization, grouped machining and the improvement of the entire technological process, sets as its basic goal the increase of the economic indicators of production.

At present the designing of flexible production sections made up of NC machine tools is being carried out by many technological design organizations of various ministries and departments. Here even within a single sector the qualitative indicators of the sections being designed, which produce parts which are similar in sizes and range, differ substantially from each other.

This is due both to the subjective approach of designers to the settlement of the technical and economic questions connected with the choice of the technological process and the composition of the equipment and to the lack of economically sound recommendations on the choice of the latter subject to the type of items and blanks and the scale and type of production. As a result this leads to the development of designs which only by chance may have technical and economic indicators which are close to the optimum indicators.

In case of the designing of flexible production sections there are many permissible design approaches due to the large number of combinations of different technological processes for not only different, but also identical types of parts, the possibility of the use of similar equipment of closely similar dimensions and, finally, the different levels and schemes of the automation of production processes. Moreover, depending on the real composition of the equipment available at an operating plant and its value the choice of the most economical technological processes for the same conditions can be different.

The task is complicated greatly due to the need for the obtaining of a decision on the basis of the aggregate of the entire range of parts being machined, and not the examination of each part separately, since a decision, which is optimum for each part separately, usually is not the optimum decision for the entire set of parts. This situation is based on the need to take into account the loading of the equipment with the entire set of parts which can be produced on it.

The consideration of all the enumerated factors and the finding with respect to their interrelationship of the most effective design approach are possible only in case of the multivariant automated designing of flexible production sections with the use of computers. Such designing should be accompanied by the comprehensive calculation of the specific technical and economic indicators of each version with the subsequent final choice of the best one in accordance with the most important criteria. The selection of the best version according to the objective quantitative indicators, as well as the completeness of the information, which is used

when making a decision on a computer, should completely eliminate the influence of the subjectivity of the decisions of the designer on the results of the work.

The designing of flexible production sections should include the most efficient technological processes, the composition of the equipment, a calculation of the manpower, the required areas, accesories, blanks, the machine tool-output ratio of production and the technical and economic indicators.

Under the conditions of the possibilities of modern technological support and the achievements in the area of the automation of control the task of the optimization of the organizational and technological structure of flexible production sections according to a number of criteria, the most important of which is the continuity of the production process, just as occurs under the conditions of mass production, is the foremost task. The achievement of such a structure for the machining of a wide range of parts of different classes will make it possible to accomplish the main task of production--the assurance of the smooth continuous production of diverse parts for the formation of sets which are necessary for the assembly of items.

The simultaneous accomplishment of the tasks of the set-by-set production of parts and the maximum utilization of the equipment leads to the increase of the total production of finished items and to the simultaneous meeting of the basic requirement of all production--the increase of its smoothness, which is the most important prerequisite of the assurance of the high quality of items. Such a statement of the task is at variance with the traditional methods of the organization of small-scale production on the basis of standard technological processes of the machining of parts of consolidated series and a grouped manufacturing method, since for its most part it is based precisely on the subdivision of the series.

The continuity of production under the conditions of the process of machining, which is discrete by its nature and is characterized by a different content of the technological processes and a different duration of their fulfillment, in case of a change of the object of production, can be achieved on the basis of the accomplishment of the following tasks:

the formation of the technological system not on the traditional basis of the common nature of the structures of the operations and their sequence, but on a fundamentally different idea--the discreteness of the technological process for its elementary components, that is, for some standardized elements with the subsequent formation from these elements of consolidated "technological blocks." Such blocks should be synthesized with allowance made for the rules and restrictions, which are imposed by the possibilities of technological realization and by the requirements of the organization of the technological process;

the development of a system of machine tools, which simultaneously meets the requirements of the performance on each of them of both any element of the technological process and any set of them;

the unification of these two systems into an automated complex, which operates in coordination and efficiently and performs the functions of the machining, checking and transportation of parts. The complex operates on the basis of a technology, which has been transformed from a set of principles and collections of recommendations on production into a system of control actions on the operation of the entire set.

The development of automated machine tool complexes and the determination of the basic principles of their functioning and control should be based on the detailed study of production processes as objects of control and their classification in accordance with the static and dynamic characteristics. The thorough and comprehensive analysis of the properties of the organizational and technological structures from a management point of view can provide a general-purpose method of designing. It would make it possible to avoid in each specific case individual methods of the accomplishment of the tasks of control for different works.

The term "organizational and technical structure" reflects two interconnected aspects of the same systems. The organizational aspect reflects the process of the interaction of individual machine tools in the system for the achievement of such optimum dynamic indicators as the degree of continuity of the production process of the integrated production of items, the smoothness of the process, the amounts of unfinished production and so on.

The technological aspect is connected with the peculiarities of the accomplishment of the technological processes in the system of machine tools, their efficient organization and, finally, the development of machine tools and machine tool complexes with centralized control from a computer, which meet the requirements of the organizational system.

The analysis of the existing systems according to the basic criteria should make it possible not only to evaluate and compare them from the standpoint of conformity to the most important requirements of the production process, but also to give an answer to the question, to what extent do the existing methods of the construction of machine tools and their control systems make it possible to create new production structures, which are capable of satisfying to the utmost the formulated requirements. It is important to note that the indicated requirements (technical, organizational, economic, production, operational and others) can be very contradictory. It is obvious that the different automated machine tool systems can ensure the meeting of all these requirements to a different degree. The task of synthesizing such a structure of the system, which would best ensure the meeting of the requirements of the conditions of production, arises in this connection.

The analysis of the different automated machine tool systems, their comparison with each other and the identification of the basic trends of further development should be carried out on the basis of the study of mathematical models, which describe these structures and make it possible to evaluate the quality of the different systems and to identify the most preferable of them.

On the basis of what has been said it is possible to formulate the basic tasks of the systems analysis of flexible production sections:

to elaborate an abstract model of a real machine tool system on the basis of the analysis of known machine tool systems.

The model should encompass all the existing versions of the construction and organization of machine tool complexes, as well as take into account all the possible arrangements of their structures. The formalization of the complex interrelations in the machine tool system should serve as the basis for the comparative analysis of the machine tool systems for the purpose of the identification of their

peculiarities for the subsequent efficient change of the existing machine tool systems and the synthesis of new ones which are free of the shortcomings of their predecessors;

to elaborate a model of the functioning of machine tool complexes, which should be based not only on the technological potentials of the existing equipment or the equipment being designed, but also on the consideration of the various forms of the organization and management of production.

The model should be the basis of the analysis of different machine tool systems for the optimum designing of automated production complexes for the machining of parts of a specific class under the conditions of small-scale machine building production, which make it possible to accomplish the continuous flow line production of sets of parts regardless of their batch nature, labor-output ratio and complexity.

It is obvious that such a requirement creates the need for the consideration at the stage of modeling of the peculiarities of the interaction of the structures of the machine tool complexes with the structures of the technological process, which are determined for each part, as well as with the production cycles of the manufacture, storage and transportation of parts, which are determined for each item;

on the basis of the elaborated model to make an analysis of the efficient change of the basic principles of the automation of machine building works with allowance made for the behavior of a large system, the determination of the functions, structure and place in the systems hierarchy from the standpoint of such most important functional parameters as the materials, power and information in the machine tool system.

The accomplishment of this task should conclude with the elaboration of the structure of the control of technological processes and automated machine tools, which is capable of functioning under the conditions of the machining of a wide range of parts.

Such a system should ensure the flexible control of the complex in case of different new assignments with the simultaneous capability of broadening the possibilities of the quantitative production of parts as the need arises. In other words, the fulfillment of this stage of the studies should not be confined to the accomplishment of the purely technical tasks of the control of specific machine tools, but is developed in the area of the organizational possibilities of the enterprise in the area of the automation of the control of the flows of production information and in the area of the broadening of the technique of control and the technological possibilities of the equipment;

to form a set of criteria of the evaluation of the quality of the functioning of the system by the examination of the necessary elements of the system, their internal and external ties. Having limited the really permissible range of the parameters and by using the obtained dynamic model of the system, to make a comparative analysis of the different versions of the complex for the purpose of selecting the optimum functional structure.

The calculations of the efficiency should be based on the entire set of technical, organizational and economic factors, which influence the production process and act on it in a complex interrelationship. Here the consideration of the degree of

influence of the factors, which determine the economic indicators, is an extremely important basis of the proper calculation of the efficiency. Among such factors are the complexity and technological feasibility of parts, the modes of their production, the scale and batch nature of production, its specialization and structure.

The basic idea of the indicated calculations should be to select through the establishment of the ties, dependences and necessary restrictions between the parameters and the technical and organizational indicators, on the one hand, and the economic indicators of the process, on the other, the most economically feasible version of the degree of automation of the machine tools being used, which ensures the least costs of social production, which include both embodied labor (equipment, tools and others) and the living labor of the workers who are directly engaged in the production of the item;

after obtaining the optimum machine tool structure it is necessary to elaborate a mathematical model of the designing of the technological process and on its basis to synthesize the algorithms of computer designing.

It is obvious that an information reference bank, which reflects the model decisions and standard (and nonstandard) methods of designing the technology, should be created at this stage of the work. The formalization of technological designing should conclude with the elaboration of algorithms of the computer selection of the permissible structures of the technological process;

to synthesize a set of algorithms which encompass the aspects of both the adaptive control of individual units of technological equipment and their adaptive connection with allowance made for the maximum robotization of the entire machine tool complex;

on the basis of the foregoing to form a set of design and technological demands on equipment also from the standpoint of its designing, production and operation. This will make it possible to minimize the number of type sizes of units of equipment within the set, which is adequate for the construction of the practically necessary range of machine tool complexes.

Such an approach makes it possible to realize the most perfect form of the organization of the production process--flow line production.

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COMPONENTS OF TWO FLEXIBLE MANUFACTURING SYSTEMS DISCUSSED

Moscow MASHINOSTROITEL' in Russian No 2, Feb 83 pp 11-12

[Article by Candidate of Technical Sciences P. E. Safragan: "Flexible Automated Manufacturing Systems in Machine Building"]

[Text] In the Basic Directions of USSR Economic and Social Development for 1981-1985 and the Period to 1990 particular attention is devoted to the development and introduction in production of fundamentally new equipment and advanced technology, complete systems of machines for the complete mechanization and automation of production, which make it possible to improve working conditions, to increase labor productivity and to save material resources.

The extensive introduction of automated manufacturing systems on the basis of microprocessor equipment and industrial robots, which make it possible, for example, in machine building, in combination with machines with programmed control and other processing systems to create flexible readjustable lines and manufacturing systems, is of great importance.

A selection of articles, which tells about the creation of automated manufacturing systems with a flexible rearrangeable technology on the basis of NC machine tools and industrial robots, which are controlled from a computer, is published in this issue of the journal.

The rapid development and introduction in industry of sets of metalworking equipment with numerical control, which are equipped with automatic manipulators (industrial robots), are envisaged by the basic directions of the development of the national economy for the 11th Five-Year Plan, which were adopted by the 26th CPSU Congress. The creation of flexible automated manufacturing systems, which make it possible to completely automate the process of machining in series, small-series and pilot production, to ensure the minimum involvement of man in the production process and to organize the operation of NC equipment during two to three shifts, is envisaged in machine building on the basis of such robotized technological systems. The control of machine tools and industrial robots from a computer and the automation of auxiliary operations will lead to a decrease of the time per unit and will increase the coefficient of multimachine attendance by two- to threefold.

The assignment to a computer of the tasks of the operational planning and control of preproduction services leads to the decrease of production idle times for organizational reasons and to the increase of the utilization ratio of equipment. The introduction of "manless technology" during the second and third shifts is ensured by the fact that the technological process stocks (blanks, accessories, materials), which are necessary for the operation of the works during the day with the minimum number of service personnel, are prepared during the first shift in accordance with the plan assignments which are issued by the computer. The assignment to the computer of the tasks of diagnosis, recording and the monitoring of the progress of production will make it possible to decrease the idle times of equipment and to increase its reliability. The efficient preparation and the adjustment of the storage and retrieval of the programs of the control of machine tools and industrial robots will be ensured by means of the computer.

Two directions of the introduction of flexible automated manufacturing systems have been outlined: the delivery to enterprises of complete automated systems made up of NC machine tools, which are controlled by computer and industrial robots, which are produced at the plants of the Ministry of the Machine Tool and Tool Building Industry and a number of other machine building ministries, and the development of similar automated systems by the forces of enterprises in collaboration of sectorial scientific research institutes on the basis of available or supplied NC equipment and specialized control computer complexes.

The model ASV-21 automated system for the machining of parts like bodies of revolution, the model ASK-10 automated system for the machining of base members and a number of other systems can serve as an example of the realization of the first direction. They include: a subsystem of metalworking equipment (a set of milling and jig-boring machines, lathes, grinding and measuring machines with numerical control); a subsystem of materials-handling equipment for blanks and items with elements for the transportation, holding and accumulation of items; a subsystems of tools (tools, tool stores for the adjustment, transfer, mounting and fastening of tools); a subsystem of information support and software, which includes independent algorithms of the automatic preparation of production and the control of production, the determination of the methods and forms of the transmission of intermediate data between the subsystems and computer equipment; a subsystem of auxiliary technological devices and units of the automated sections and manufacturing systems, which ensure the removal of chips, the feeding of machine coolant and others.

The model ASV-21 automated system, which contains 14 units of technological equipment, has the following technical indicators: the annual output of parts--up to 120,000 units; the average annual range of machined parts--up to 3,000; the average size of a batch--20,000 units; the time of preparation of one control program--15 minutes; the time of operation of NC machine tools according to the control program--up to 0.6 hour; the anticipated idle times for organizational and technical reasons--not more than 20 percent of the available time; the annual economic impact--about 200,000 rubles with payback in 4.5 years.

The direct numerical programmed control of the machine tools of the system is carried out from a control computer complex (the M-6000 control computer complex, set No 2), which is connected with machine consoles like the N22 and N33. The task of the computer consists in the operational accumulation of the control programs (up to one shift) and their worker-by-worker transmission by the consoles of the

machine tools on request from the workplaces. Moreover, the diagnosis of malfunctions of the control system of the section is ensured.

The tasks of planning and recording in the section are performed by a second control computer complex, like the M-6000 (set No 6), which performs the following basic functions: the development of production operations; the issuing of assignments for the workplaces for all half-shifts with the calculation of the utilization and the minimum losses in case of the readjustment of the machine tools; the recording of the performance of operations, the formation of a library of control programs, the recording of the fulfillment of the monthly production assignment with the issuing of a summary of the progress of fulfillment. The system is attended by a production control engineer and an operator of the M-6000 control computer complex.

The model ASK-10 automated system for the machining of base members on NC machine tools, which are controlled from a computer, contains 10 units of equipment: model MA6907PMF4 multi-operation NC machine tools, a measuring machine, general-purpose machine tools with manual control for preliminary machining and an automated warehouse. The introduction of the system increases labor productivity by 2.5- to 4-fold. The anticipated annual economic impact from its introduction will come to 75,000 to 350,000 rubles. The use of an M-6000 control computer complex at the shop level and of NC devices like the Razmer-4M and the U852 is a distinctive feature of the system. The devices have been assimilated in series production.

Centralized control from the M-6000 control computer complex ensures the performance of the following functions: the automated elaboration of the control programs, the adjustment of the machine tools, norm setting, planning, the supply of complete sets of tools, operational shift planning with the issuing of a plan assignment for each workplace, production control, the recording of the progress of production (the formulation and issuing of reporting data), the assurance of reliability (the planning of the preventive maintenance and regulation of equipment), the supply of cutting tools and accessories, the management of the warehouse.

The creation of computer-controlled automated sections at a number of enterprises is an example of the realization of the second direction.

In conformity with the procedural recommendations of the scientific production association of the Experimental Scientific Research Institute of Metal-Cutting Machine Tools it is possible to create robotized technological complexes under the conditions of mass, series and small-series production at both operating enterprises and enterprises which are being planned. In machining the creation of robotized technological complexes is characterized by relatively much machine time, which creates for the robot the possibility of multimachine attendance; by the presence of complicated and precision equipment, which requires the mounting of parts with the minimum clearance; by a large number of rapidly wearing tools, which creates the need for the use of their automatic adaptation or the compulsory replacement of the tools; the presence of a large quantity of chips of different types, the possibility that they will get onto the location surfaces of the machine tool attachments and the need for their removal from there. Moreover, the diversity of the types of metal-cutting equipment and the types of machine tool attachments in a single technological flow creates the need for the selection of industrial robots, which have an adequate degree of versatility and the possibility

of the automatic interchange of grips; the diversity of the organizational and technical forms of production leads to their revision in case of the development of robotized technological complexes; the great length of the technological flows and the existence of the interruption of the flows (by thermal, bench, marking and other operations) complicate the development of automated systems; the lack of preparation of the machine tools, even with a sufficiently high degree of automation (NC machine tools, semi-automatic machines, multiple-tool machine tools), for operation in conjunction with industrial robots creates the need for their modernization (systems of control, automation, the transfer of the safety device, the clamp of the part and others).

The enterprises during the preparation and in the process of the development of robotized technological complexes should, with allowance made for the peculiarities of the specific works, jointly with the sectorial scientific research institutes solve the problems of the selection and analysis of the range of parts, the determination of the composition and necessary quantity of technological equipment (machine tools and industrial robots) with numerical control, the selection of the necessary materials-handling, warehousing and auxiliary equipment, the creation of a system of tool supply, the determination of the standardization and the required quantity of accessory equipment, the determination of the principles of the construction of the software of the control system of the robotized technological complexes, the making of calculations of the structure of the specialized computer control complexes, the determination of the composition of the necessary nonstandard equipment for the system of the grouped control of the NC machine tools from a computer, the selection of the system of the monitoring of the progress of production and quality control.

At present there are no published, scientifically sound methods and recommendations on the solution of the majority of the indicated problems. Therefore the experience of the leading enterprises, which is set forth in the selection of articles published below, which was compiled in accordance with the materials of the scientific and technical conference "The Use of NC Technological Equipment for the Automation of Production in Machine Building," which was held in Kiev in April 1982, is of considerable interest.

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CONTROLLER DEVELOPED FOR CNC-MACHINES AGGREGATE

Moscow MASHINOSTROITEL' in Russian No 2, Feb 83 pp 23, 24

[Article by engineer Yu. M. Nurgaliyev: "The Complex of Non-Standard Equipment for the SPURT [System for Programming, Control and Editing of Production Processes] System"]

[Text] A system for programming, control and editing of production processes (SPURT) for machine tools with NPC [numerical program control] has been developed. The SPURT system permits a group of machine tools with NPC devices to be controlled, and it also permits machine tool control programs to be compiled, as well as their check-out, storage, correction and editing.

The controlling computer complex UVK SM3 (SM4) is used as the central computer. Creation of various configurations are possible based on models of the SPURT system, the fundamentals of which are as follows: a system for controlling a group of machine tools with NPC devices (up to 32 units); a multi-console system for operative program preparation (up to 8 terminals for programmer-engineers) and an automated sector based on the SPURT system.

The SPURT system consists of program and equipment sections. The latter includes complexes of optional equipment (COE) and of standard equipment. The COE is intended for connecting the UVK SM3 (SM4) with NPC devices such as the N33-1M, N33-2M, "Modul' M-221", and the "Kontur 2PT-71", as well as the consoles of the machine tool operators, production engineers and the CNC [Latin characters] system, which was built based on the "Elektronika-100I" computer to control machine tools equipped with PFST-12-500 consoles.

The SPURT system hardware includes the basic UVK SM3 (SM4) complex, which includes the following devices:

--an SM3 (SM4) processor;
--an operative 28K memory of 16-digit words for controlling a group of machine tools with NPC devices or a multi-console system for preparing programs, or 64K of 16-digit words for an automated sector, permitting both the group of machine tools to be controlled and programs to be prepared;
--an FS-1501 device for input from perf-tape;
--a PL-150 device for output onto perf-tape;
--an IZOT 1370 magnetic disc storage unit;

--a VTA-2000 system terminal, and
--a DZM-180 [Latin characters) alpha-numeric printer.

Peripherals to the UVK SM3 (SM4) complex include the following hardware for the SPURT system:

--an "Elektronika-100I" computer;
--NPC devices;
--consoles for production engineer-operators (VT-340 [Latin characters] or RIN-609 video terminals which may be used as standard machine tool operator consoles, and
--a UKP-1M coordinateograph permitting graphic control of the machine tool control programs at the level of equidistants.

The following assemblies and units are included in the COE:

--units connecting the N33-1M, N33-2M, "Modul' M-221" and "Kontur 2PT-71" NPC devices;
--controllers for the N33-1M, N33-2M, "Modul' M-221" and "Kontur 2PT-71" NPC devices;
--the machine tool operator console;
--an interprocessor communication module;
--the "Elektronika-100I" controller, and
--controllers for the VT-340 and RIN-609 alpha-numeric displays.

The controllers for the peripherals are situated within the cassette interface unit (CI) and the system expansion unit of the UVK SM3 (SM4). When the BRS-2 [system expansion unit], consisting of 2 CI's is being used, it is possible to connect 6 more external devices. In light of the restriction on load capacity of the UVK SM3 (SM4), a further increase in the number of external devices is accomplished by using the SM-4101 interface. The units for connecting the NPC devices are located within the NPC columns, and they are connected to the proper controllers through standardized internal and external cable connections. The interprocessor communications module is installed in the "Elektronika-100I" computer hook-up. Information exchange between the controllers of the UVK SM3 (SM4) and the peripherals occurs by byte in parallel code on the "inquiry-response" principle under control of the inquiry signal being formed in the device requesting a byte of information and of the strobe signal accompanying this byte of information. In design the peripherals controllers consist of two boards: boards for decoding the address and controlling the break (the BE810M unit) and information input-output boards (the modernized BE811M unit). The peripherals controllers have a fourth level of break-in. Type 559 receiver-transmitters of the K599IP1 and K559IP2 series are used in the controllers and connection units as receiver-transmitters. To increase the resistance of the communication channel to interference, information transmission is accomplished through a "wrapped pair" telephone cable with "zero" level. To match the wave resistance of the communication cables over the input and output of the receiver-transmitters, matching resistors have been installed. A variant of the parallel communication channel with optron by-pass, where the K293LP1 integrated microcircuit (IMC) is used as the receiver and a K559IP1 IMC as

transmitter, has also been developed. The transmitters and receivers of the communication channel with optron by-pass are situated on the receiver-transmitter board, which is installed on the place where it is inserted into the CI.

The unit for connecting the NPC devices consists of the following devices:

--a work mode commutator;
--a buffer data register;
--circuits for forming the synchronizing signal and the inquiry;
--circuits for inputing service commands from the NPC device into the UVK SM3 (SM4), and
--circuits for controlling the NPC device during repeated restarting or in situations of malfunctioning.

The machine tool operator console (OC) is intended for operational two-way information exchange between the operator and the UVK SM3 (SM4). The OC is executed as a separate design unit situated near the machine tool on a carriage. A universal indicator device (UID) is used in the console as an information display indicator; 16 alpha-numeric information characters may be registered on its screen.

The SPURT system permits the period for preparation and check-out of machine tool control programs to be reduced by a factor of 3-7, decreases the time for start-up of new parts into production by a factor of 2-3, reduces the number of qualified workers in small series and auxiliary production, improves the quality of parts manufacturing and the labor productivity of production engineers by a factor of 3-7, and of machine tool operators by 10-15 percent. The economic effect from incorporating the SPURT system is R150,000 per year when controlling 6 units.

9194
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PRESENT, FUTURE OF 50-YEAR OLD 'URALMASH' PLANT DISCUSSED

Moscow NEDELYA in Russian No 28, 11-17 Jul 83 p 2

[Interview with Yevgeniy Andreyevich Barnachev, General Director of the "Uralmash" PO [Production Association], deputy of the USSR Supreme Soviet, by Svetlana Tyurina and Lyudmila Rybina, NEDELYA correspondents, "Our 'URALMASH'!" Date and place not specified]

> [Text] Yes, this is so: exactly 50 years ago, on 15 July 1933, the Ural Heavy Machinebuilding Plant -- the leading enterprise of the now famous "Uralmash" Production Association began operation.

[Question] Yevgeniy Andreyevich, what, in our opinion, is a half century for such a plant -- a long time or a short time?

[Answer] How shall I answer your question? -- Of course, half a century, in general, is not so little. Yet, it not so much. The main thing here is something else -- "Uralmash" became a distinct landmark in the development of the young socialist state in creating the foundation of our industry. We do not feel "our age" much. Apparently because we feel our strength and the possibilities of solving more and more complicated economic, social and technical problems. Our production is expanding, is being rejuvenated constantly. And this, obviously is also an inspiration!

[Question] What does the "Uralmash" "household" represent?

[Answer] Well, if only in two words, then "Uralmash" -- is a "city-plant." Included in the association are, along with the Uralmash Plant proper, four affiliate plants: the Sverdlovsk Drilling and Metallurgical Equipment Plant, the Sverdlovsk Mine Safety Equipment Machine Plant, the Bulanashskiy Machinebuilding Plant and the Verkhnepyshminskiy Welded Machinebuilding Structures Plant. The association also includes the Scientific Research Institute of Heavy Machinebuilding (NIItyazmash). Moreover, two construction-installation, motor vehicle transport and RR administrations. Such is the "household!"

The plant grew and the city grew in parallel. The association now has available large housing resources and a network of childrens' cultural and sanitation establishments. Also our working farm system is developing.

[Question] You said: "city-plant." But "Uralmash" is sometimes also called "the father of plants." What is that -- is it only a beautiful image or are there, actually, plants obligated to him for their birth?

[Answer] First of all -- where did this image come from? Aleksey Maksimovich Gor'kiy, on 15 July 1933, addressed the Uralmash people as follows: "Here, the dictator-proletariat has created one more mighty fortress, erected one more structure which is the father of many plants and factories." Today, we can actually say that this is not simply a bright and precise word of a great writer, but is reality -- real enterprises equipped with equipment manufactured at the "Uralmash."

Last year the order department of our association attempted to create a map showing the plants where Uralmash machines and equipment are in operation. Lines were drawn between Sverdlovsk and cities and settlements and... the entire map was crosshatched. In oneyear, we supply our products to 3000 facilities!

[Question] From the very first day of starting up the plant, the Ural machinebuilders faced the problems: catch up and overtake industrially developed capitalist countries. Did "Uralmash" solve this problem? How is your equipment evaluated by specialists abroad?

[Answer] So far there are no single evaluations available in this rivalry. In some things we are ahead of the West. In some things we must "draw ourselves" up to the best world specimens. Briefly, much work is still to be done.

There are machines and equipment with the "UZTM" [Ural Heavy Machinebuilding Plant] brand operating in 35 countries of the world. It can be said that the following plants originated due to the "Uralmash": the Bkhilaysk Metallurgical Combine and the Bokaro Metallurgical Plant (India); the Anshan Metallurgical Combine in KNR [Chinese People's Republic]; the "Erdenet" Ore Dressing Combine in the MNR [Mongolian People's Republic]; the Kheluan Metallurgical Combine in the ARE [Arab Republic of Egypt] and many others...

[Question] What new equipment is being created today in the association?

[Answer] There is much of it. A very great deal. And it is actually new, advanced equipment. May I cite just one figure: the national economy will save about 130 million rubles by using new equipment produced by Uralmash in only the first two years of this five-year plan period. Why will it save? Because product quality increased, the design is simpler and the technical-operating parameters of the machines were improved.

Here, for example, we changed over to series production of the ESh-20.90 walking excavator. Its productivity is 33 percent greater than the previous model, while it uses 20 percent less metal. Only one such machine will save 350,000 kilowatt-hours of electrical power annually. This year the first "4000E-1" drilling rigs will be manufactured. A controlled drive for drill pumps is used in this machine which makes it possible to save up to 150,000

kilowatt-hours of electrical power on one installation. Other examples may be cited. The service life of our machines is measured sometimes in decades which means that they must be designed and manufactured with a "distant aim." It means that not only are literate designs needed -- but we must orient ourselves for tomorrow. And that is the way we proceed.

[Question] It is well known how important robotizing production is today. Did you include robots in your staff? And another thing: will the "Uralmash" some day become, or even in the very distant future, an automated plant?

[Answer] An automatic plant? What is an automatic plant? Roughly, of course, in a simple schematic form, it is an enterprise where parts are processed automatically and they are transferred from machine tool to machine tool without human participation. But as far as automation of processing is concerned, the "staff" of the "Uralmash Plant" contains about 180 machine tools with numerical programed control today. Yet, to "entrust" robots with transferring parts from machine tool to machine tool is complicated. Have you been in our shops? Did you see the huge metal structures lying along the row of machine tools? To an outsider this looks like chaos. To a robot -- also: it cannot select from the "heap." Also the weight of these parts of up to 150 tons is too much for it.

I think that robotizing is economically justified primarily on a conveyor when mechanized arms remove, transfer parts at a high frequency, free man from monotonous operations, while parts that we have to manufacture stand on machine tools for many hours. For example, rollers of cold rolled machine tools -- from five-ten hours, while machining of the heaviest parts continues even weeks. A robot here would "rest" more than work.

Nevertheless, reducing manual labor and freeing workers -- is also an urgent problem for the "Uralmash." Recently in the NIItyazhmash [Scientific Research Design Technological Machinebuilding Institute] there was created a consolidated robotization laboratory. Two automated technological facilities were developed which will be placed in operation in this five-year plan period: a group of finishing-off machine tools and processing centers will be connected to a computer which will help utilize machine tool time to a maximum. A machine tool completes one operation, data is sent to the computer and it decides which part to feed next so that rearrangements, tool changes etc. are kept to a minimum. Idle times of workers and machine tools will be reduced to a minimum.

Shops that manufacture consumer goods will be robotized by the end of the five-year plan period. However, in spite of the importance of such goods, the image of our enterprise is not determined, of course, by this subdivision.

[Question] You spoke about"goods for everyone." The "Malyutka" washing machine is your product. By the way, many people would like to buy one but, as is well known, the output of the "Malyutka" is limited. Therefore, we have two questions: is it difficult to manufacture consumer goods which are in such great demand at an enterprise such as yours? And are you not planning to increase the output of the "Malyutka"?

[Answer] Difficult or easy? Of course, difficult. But in spite of this, we are for having consumer goods remain our "traditional" output. First of all, we will point out that we created specialized shops for their production. The "Malyutka" is only one of our products. Its success, I think, is due to the fact that we did look for easy ways: we simply decided to manufacture not what we could assimilate easily but what every family actually needed. It was troublesome, especially at the start. It was quite difficult to convince the trade to accept a product so unlike traditional washers. Were it not for our persistence and efforts, housewives would not have seen the "Malyutka."

At present, a special design bureau of the NIItyazhmash develops new goods. The technological services introduce the goods. Recently, besides washers, we have begun to manufacture "Kristall" kitchen sets, television stands, vegetable garden wheelbarrows and "Otdykh" lawn furniture sets.

Have you seen boys on the streets on the "Sport" skateboards? Those are our product. The first lot was just received by the commercial network -- I hope the novelty will please people. Soon our "Druzhok" electromagnetic pumps will appear in stores. They are needed by gardeners and summer residents in the country. Those who like to make things at home will be pleased by a small universal woodworking lathe. Of course the decision to increase the production of"goods for everyone" was made only with respect to the most popular products, and to have each new product certified by the State Emblem of Quality.

[Question] "Uralmash" is famous for its work and its people. But the "Uralmash" of the thirties had one kind of people while in the eighties -- entirely different ones... Is it possible to preserve the "Uralmash" style?

[Answer] I will reply to your question. But perhaps I will start with an example which, at first glance, seems no answer.... Here at the Nazarovskiy strip mine the ESh-100.100 special design walking excavator operates that carries the name of our famous countryman, prospector, Hero of Socialist Labor, Nikolay Ivanovich Kuznetsov. There are no machines like it in mining equipment in the world in power and productivity. Does it not seem strange to you that while an excavator is not a motorship, its "side" carries the name of a famous man? But, in our collective, it is customary to give names of the best to large new machines -- and primarily, the best workers. The names of Pavel Konstantinovich Spekhov -- worker-instructor in the first five-year plan period,who was the first to propose working on one order; the names of workers of the Bondarev and Nikiforov dynasties are borne by open-pit excavators. Two drill rigs remind everybody of the Korneyenko and Durnyshev dynasties.

Families, dynasties, youth instructors -- without them it is impossible to develop labor traditions. Here I must stress that working continuity -- is not only a family matter. It is a huge social-economic gain to the entire society. Here, as a rule, is the painless "accustoming oneself" of a new person to the collective, stable discipline and a reduction in worker turnover. The young generation feels involved in the life and destinies of its collectves.

And this, if you will, is one of the special features of our style.

Much of what "Uralmash" is famous for is in the textbooks of history. During the war years the name of the distinguilshed steelworker, D. D. Sidorovskiy -- initiator of accelerated welding fusion, thundered through the whole country. At the same time, a locksmith-guager, A. Chugunov, headed the "leading worker" movement at the plant. His followers achieved phenomenal labor productivity records. Now it is almost frightening to mention figures -- up to 1750 percent of their daily output, but nevertheless -- this is a fact. Today, the continuation of those glorious practices became the initiative of the turner brigade headed by A. M. Korolev, member of the CPSU Central Committee. After the 26th party congress, on the initiative of his brigade, a movement developed in the association for overfulfillment of the daily shift targets. Over 6000 piecework workers and 550 brigades participate in it and this is very fruitful.

[Question] Of course, we understand that you as the director must, in accordance with your position, be pleased with your plant. But what is there that does not please you? What is the "Uralmash" director concerned about today?

[Answer] Yes, I love the Uralmashzavod. But not only because of my position. My father -- Andrey Nikolayevich -- was the chief economist of the plant. My sister and wife work here at present. I have been working at the plant since 1956, since graduating from the metallurgical department of the Ural Polytechnical Institute.

I am concerned at present, as are all Uralmash people, about the problems of developing our enterprises. We are held back by intermediate product production. The cast iron shop has not been modernized since the plant was started. There are also difficulties in the copper casting shop. Also the steel casting shop has not changed much.. And yet, if there are no precise castings, the ingot tolerances are high, machining becomes more complicated and it becomes necessary to remove many metal chips.

Welding production also requires further development.

[Question] All this -- production. But about daily life? Are you satisfied with the daily life at the plant -- the conditions of the dining rooms, showers, buffet and changing rooms? The organization of services at the "Uralmash?"

[Answer] There are still many problems here although in the first two years of the five-year plan period alone, almost two million rubles have been spent on improving the working and living conditions of the workers.

Until now, old shops built in the prewar years are of great concern to us. Working conditions are more difficult here. Obviously, first of all, we work precisely in these shops. There are three medical-sanitary facilities for metallurgical production workers. Each such facility is excellently equipped with Russian baths and saunas, rest rooms with modern musical stereos and color television. Here one can drink tea from a samovar. The steelworkers, foundry cleaners and patternmakers are satisfied with the innovation; such rest relieves accumulated stress and nervous and muscular fatigue.

The technical project of expanding the Uralmash Plant specifies the construction of several more such facilities. It is planned to build well-equipped administrative-personal service buildings for the iron foundry, forging-pressing and welding shops. Moreover, a large dining room will be opened. Briefly, the program is broad and we are implementing it fairly successfully.

[Question] Today the Uralmash is half a centruy old. What if we peek 50 years ahead? How iwll the association meet its 100th anniversary?

[Answer] Yes, that is rather far away, of course... But if it is necessary, it is necessary -- Evidently, "Uralmash," will supply as before, high productivity metallurgical, forging-pressing, crushing-grinding, excavator and petroleum drilling equipment to the national economy. Only, obviously, all of this equipment will undergo considerable design and technological change. These will be qualitatively new and more productive machines.

I hope the "scarcity"problem will be solved fully. The very concepts of "labor scarcity" and "intermediate product scarcity" will disappear. Conditions will be created for the wide use of computers and the automation of machine assembly. Environment protection problems will be solved fully.

By the way, in my opinion, this is not a too long-range perspective. But how we wish for it to come sooner!

2291
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AUTOMATED MACHINING CENTERS AT IVANOVO PLANT DISCUSSED

Moscow EKONOMICHESKAYA GAZETA in Russian No 19, May 83 p 4

[Article by Yu. Katkov, chief of the Labor and Wages Department of the Machine Tool Building Association imeni 50th Anniversary of the USSR, Ivanovo: "On the Road to Intensification--The Know-How of the Ivanovo Machine Tool Builders"]

[Text] In the Ivanovo Machine Tool Building Association imeni 50th Anniversary of the USSR, the motto "Engineering support for the workers' initiative" is being realized in a competition for increasing labor productivity. Due to the incorporation of new equipment and technology, the number of work slots is being reduced with an increase in production volume.

This year USSR Gosplan and the Ministry of the Machine Tool Building Industry have completely released the association from production of universal machine tools. The annual production of "MJ" ("machining journals") reached 200 units, and this figure will grow continuously with the simultaneous improvement in the operational characteristics of the machinery being produced. Taking a blank, the machine converts the metal into a finished part following a specified program. An operator controls the "machining journal." As experience shows, he may be trained over a period of 3-4 months. Having acquired the skills, he is capable of running one or 2 more "journals."

I wish to emphasize the following circumstance. For enterprises which have purchased our "MJ," the association trains programmers and electronics workers, compiles the necessary programs, furnishes tools and sends out repairmen.

Of the 1,000 units of equipment on hand in our shops, 130 are of the newest type, i.e., about 1/8, and about 70 percent of all operations for machining parts and assemblies are performed on this equipment.

In connection with the progressive changes in the structure of the machine tool inventory, many antiquated universal machine tools turned out to be "out of work." In 1981 we retired 26 machine tools, 27 in 1982, and now we will sell no less than 30.

Since the start of the 11th Five-Year Plan, the total number of work slots in the association has decreased by somewhat more than 100. People who have been released here have been directed to other shops. Work was found for everyone. A certain part of the machine tool operators were retained and requalified as mechanics, which are urgently needed on assembly and installation and wiring jobs.

Primarily due to retooling, the entire increment in production at the association is being ensured without increasing the total number of industry-production personnel. During the past two years of the five-year plan, labor productivity grew by 15 percent. This year, in comparison with 1982, it is growing, according to our calculations, by 8 percent, which exceeds the plan quota. Thus it was recorded in the socialist obligations for the collective of Ivanovo machine tool builders.

Of course, operational workers have been found in the shops who are unwilling to part with the extra equipment. They try to leave it, to hold on to the old machine tools just in case ("and suddenly we will have need of them.") We assure them, demonstrate that each surplus, and moreover inefficient, productive aggregate requires maintaining an extra work place, and, as a rule, in the final analysis, we help them to overcome their overcautiousness.

Our collective does not intend to rest on their achievements. The so-called 'unmanned technology' and industrial robots are being introduced. A sector called "Talka-500," mechanized and automated to a high degree, has been established. Within it, a transport system which feeds blanks from an automated warehouse without human participation has been connected to the "machining journals," which have been built in a row.

A piece of electronic machinery runs the entire complex. Labor productivity on this sector, which is still in testing, is approximately one and one-half times greater than on neighboring sectors. It is understandable that here a little bit more knowledge is required of the operator than on the individual "MJ." After all, it combines the function of troubleshooter, for which up to an additional 30 percent of the standard wage is paid to him as a worker whose wages are based on an hourly rate. There is also a prize, the size of which depends on the productive use of machine time.

9194
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PLANT MANAGERS SLOW TO ACCEPT ROBOTS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 6 Aug 83 p 2

[Article by Candidate of Technical Sciences I. Goloto, chief engineer of the "Soyuztekhnopribor" VPO (all-union industrial association) and scientific leader for robotizing instrument manufacturing, under the heading "Labor Productivity -- Key Indicator": "Robotization Program"]

[Text] If instrument manufacturers had been told some time back that they would have to manufacture and introduce 30,000 robots and manipulators before the end of 1986, many would probably have been astonished at that figure. After all, specialists are aware that we plan to raise the number of such machines nationwide to 45,000 during the five-year plan. Nonetheless, that figure today sounds usual and appropriate, signifying a taut, but entirely feasible goal as outlined by the branch five-year production robotization program.

This program was approved by order of the Ministry of Instrument Making, Automation Equipment and Control Systems last April. It did not materialize out of thin air; the branch had at that time more than five years of experience in the development and use of automatic manipulators. Upwards of 1,500 of them were already operating at our enterprises. However, we were not satisfied either with the numbers or with the pace of the robotization. We considered instrument making to have a significant influence on the technical level of the whole national economy and naturally, as an objective necessity, progressive forces must be developed especially rapidly in our branch. That is why it was decided when developing the program that we need a strong, sharp spurt forward, a focusing of forces on this problem, so very important to technical progress.

To this end, a special out-of-town meeting of the ministry collegium was held in Leningrad. As is known, the Leningrad party organization appreciated the importance of robotization before others.

We then organized a branch exhibit in the Moscow suburb of Ramenskoye to show what robots are capable of and how their production should be set up. All enterprise directors, chief engineers and chief technologists visited it.

An operations group headed by first deputy minister V. Rybakov was created for full-time supervision of implementation of the program. The group examined dozens of organizational-technical problems involving robot production and

introduction in eight meetings, including the out-of-town meeting. Similar groups have been created at all all-union industrial associations and at enterprises. They are headed by the VPO [all-union industrial association] chiefs and enterprise directors. Moreover, robotization bureaus are operating at each plant.

The creation of territorial robotization centers (TRC) in 19 regions has been a very important organizational factor. Their tasks include, along with coordinating work at branch enterprises within the regions, maximizing the use of the scientific-technical and production potential of other branches, USSR Academy of Sciences institutes and VUZ's. We have placed great hopes in the TRC's, which have thus far been justified. We are basing their work on the fact that we will not be able to cope fully with robotization without interbranch integration.

In order to involve more engineers, designers and technologists in robotization, we needed to create a moral and material interest in people. A special statute granted enterprise directors the right to spend on material incentives up to 70 percent of the savings obtained by introducing robots. Moreover, personal salary bonuses and one-time non-salary bonuses were anticipated for robotization participants.

All this ensured the viability of the order. Organizational and technical measures were supplemented by explanatory work in the form of seminars based at leading enterprises, branch exhibits, special conferences, film showings, publication of reference works for exchanging experience, and so forth.

I should like to emphasize once again that it is considerably more important in this initial period to consider not the number of robots being introduced but the number of specialists and leaders we succeed in convincing, since success in implementing the program will in the end depend on them. Even today, there are already many leaders who appreciate the promise and importance of automating using robots. We became convinced of this during a visit to enterprises led by such fans of robotization as A. Kazantsev and V. Gorshkov, directors of the Minsk and Petrodvortsovyy watch plants, G. Kligerman and A. Lyashenko, directors of the Saransk and Uzhgorod tool-manufacturing plants, L. Kuklik and V. Martynov, directors of the "Prompribor" production association in Orlovskiy and the "Vibrator" production association in Leningrad, and many others.

It is for good reason that I accent the attention being paid to enterprise directors. It is hard to demand receptivity towards robotization of a collective whose leader himself has not yet worked through the complex problems of this new line of automation. And experience has shown that it is not at all easy to persuade the directors. The fact is that the introduction of robots demands a comprehensive approach, inasmuch as it touches practically all aspects of enterprise activity. The necessity arises of thoroughly restructuring production, of major personnel training and retraining, of rejecting traditional views, of overcoming psychological barriers. And it turns out that far from every leader is prepared to do this. It is perhaps for this reason that some directors, while recognizing the importance of robotization in theory, temporize and delay.

We recently received from the territorial robotization centers lists of directors who were exhibiting conservatism in the use of these mechanical assistants.

To our great surprise, several leaders of red-banner collectives appeared on this list as well. Apparently, even they required time to realize the inexhorableness of the coming of industrial robots. The collegium decided to hold a special meeting with the directors of enterprises lagging in robotization and to closely examine the reasons for the delay in this work.

However, we now have grounds for declaring that the main step this past period has been the acceptance and support of the robotization program by a majority of the branch collectives: robots are now being used at 130 of our plants. Plans have been carried out successfully, and upwards of 3,000 mechanical assistants are performing their functions precisely. They are participating in the manufacture of watches, thermocouples, displays, bellows and other items. More and more automatic manipulators are being used in stamping, welding, casting, machining and painting.

The build-up period has been reduced to a minimum by implementation of the complex of measures anticipated in the order. This past year, we have set up the series production of planned robots, manipulators and devices for creating robot-technological complexes. Four branch plants have been specialized to manufacture this equipment and 24 plants are producing assembly components for it.

We see as an inestimable benefit of robotization the improvement in product quality and the development of production facilities which can be adjusted easily and quickly to produce new items. And specialists have estimated that in instrument manufacturing, accelerating output up-dating by just six months will provide a savings of 100-150 million rubles annually. And expenditures on the robotization program during the entire five-year period will be 250 million rubles.

We must often listen to enterprise leaders ask why they are obligated under the plan to introduce robots when they are more in need of automatic machine tools, progressive multiple-operation stamps, and so forth. Possibly true. But why, then, don't we see this equipment in the shops? The answer generally comes in the form of a whole bunch of reasons: not enough tool-makers, designers, technologists, and small mechanization shops. Such leaders should be reminded once again that expenditures on robotization are in the final analysis two to 2.5-times lower than expenditures on rigid automation, that robots are multipurpose, and that, by setting up their large-series production, the branch can be of considerably greater assistance to each enterprise.

At the same time, we are by no means thinking that robots have become an end in themselves, nor do we reject in any way other directions of automation. On the contrary, we are counting on the assistance of other lines of the program as a whole to raise the technical level and production standards at our enterprises, to broaden the comprehensive mechanization and automation work front. It is well-known how important the June CPSU Central Committee Plenum considered these problems, emphasizing, as it did, that accelerating scientific-technical progress and production mechanization and automation are the shortest path to resolving such key socioeconomic tasks as a fundamental improvement in labor productivity and working conditions.

Implementation of the branch "Robot-1" program will enable us to free 45,000 persons for other work, and primarily those employed at difficult, monotonous jobs. It is towards achieving this result that the efforts of instrument manufacturers are currently being directed.

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